Beef Session:

Moderator: Gary Rupp

How Much Is That Heifer Worth?

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Introduction

My decade of analyzing Integrated Resource Management (IRM) cooperator beef cow herds suggests that heifer retention and replacement strategies have a large impact on long-run profits. What seems to separate profitable beef cow herds from less profitable herds is what is done with the females in the herd and when it is done. Financial problems are frequently exacerbated when replacement heifers are retained at an improper time during the cattle cycle.

The beef cattle cycle typically leads to cash flow "booms" during high-priced times and cash flow "busts' during low-priced times. The beef cattle cycle, its resulting beef price cycle, and resource costs are the three most important factors affecting the long-run profitability and sustainability of today's beef cow producers. The timing of herd expansion, and the buying and selling of females, seem to be particularly critical to the long-run profitability of a beef cow herd. This paper presents a procedure for determining the economic value of a bred heifer at any point in the cattle cycle.

Objective

The objective of this article is to describe a procedure that beef cow producers can use to project the economic value of a bred heifer at any point in the cattle cycle. By comparing the economic value of a bred heifer to a heifer's acquisition cost, long-run beef cow profits can be enhanced and potential cash flow shortages negated — or at least reduced.

Background

The economics of running beef cows is highly influenced by the beef price cycle. The beef price cycle corresponds directly to cattle cycles but moves in the opposite direction. A beef price cycle starts out low in the middle of a decade, increases through the end of that decade and the beginning of the next decade, only to decrease toward the middle of the second decade. The current beef price cycle is projected to run from 1996 through approximately 2006.

The "economic value" of a bred beef heifer is the sum of that heifer's future annual net cash incomes plus her final cull market value. More specifically, it is the sum of her future annual net cash incomes discounted back to today's dollars.

Economic value is different than the current spot market prices. Spot market price tends to be highly correlated with current calf prices. For example when calf prices were high in 1993, bred heifer prices in the Northern Plains were $1,000 or more per animal. Some bred animals sold for over $1,400 per cow. On the other hand, my calculated economic value for a bred heifer in 1993 was $640 due to the projected low calf prices in 1994, 1995 and 1996. Spot market prices tend to be based on current calf prices and economic value is based on projected future prices.

As we now enter the price increasing-phase of the current beef price cycle, calf prices are projected to go up over the next few years and the sale barn price of bred heifers is projected to follow accordingly. My calculated economic values for bred heifers, have already peaked in the current beef price cycle. Typical beef cow producers, have not yet seriously began to expand their beef cow herds. Typical producers are projected to start herd expansions by holding back year 2000 heifer calves.

Beef cow producers should add replacement heifers whenever the heifers have economic values that are greater than the acquisition costs of the bred heifers. The greater the difference between the economic value and acquisition costs , the higher the herd's profit

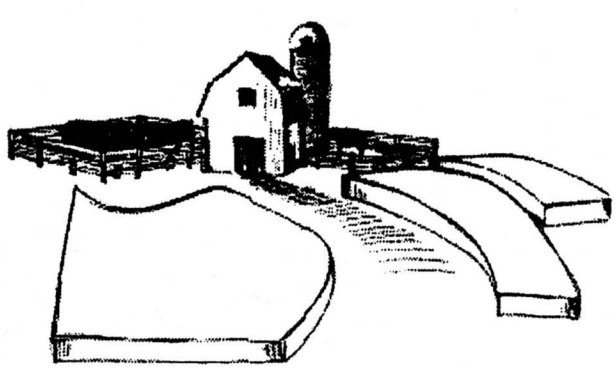
potential. Maximizing the difference between the economic value of a bred heifers and the heifers' acquisition costs is a key determinant in the long-run profitability of the beef cow herd.

Proper timing of heifer retention during a beef price cycle is critical to maximizing beef cow profits. As we now enter the price-increasing phase of the current beef price cycle (1999-2002), economics favors adding heifers and cows to the herd that can produce calves immediately (1999 through 2004). Since years 2004 through 2008 are projected to again be low-profit years, heifers producing calves during 2004 through 2008 are discounted. Management strategies that produce calves during the middle part of the beef price cycle and reduce calf production in the first and last part of this beef price cycle are projected to increase total profits over the complete cycle.[a]

Economic Principles

Three economic principles need to be brought into play when determining the economic value of a bred heifer. First, if a beef cow producer wants to know where he is making money in his business, he has to first divide his ranch or farm business into profit centers, as illustrated in Figure 1, and treat each profit center, as a stand alone business. A beef cow profit center is also different than a backgrounding or stocker profit center which is different from a retained ownership profit center. Forage production is also a stand alone profit center that sells forage to the beef cow profit center at a fair market price. The forage profit center is then credited for the fair market price of the forage fed to the beef cow profit center.

Profit center analysis allows beef cow producers to know if they are making money running cows, raising forages, cash gain farming, etc. Profitable managers expand the profitable profit centers and downsize or discontinue the unprofitable profit centers. Without the profit center analyses, producers do not know what to expand and what to downsize or discontinue.



If you want to know where you are making money, divide your farm into profit centers such as these, and treat each one as a separate business.

Figure 1. Profit centers.

Second, managers need to have an enterprise account that portrays the annual profit and net cash flow income generated by the beef cow profit center. All resources consumed by the beef cow profit center are identified and at both cash costs and economic (opportunity) costs.[b] All products produced in the beef cow profit center should also be quantified and priced. Gross returns should be based on accrual accounting principles; that is, made up of the familiar cash incomes from products sold and the not-so-familiar non-cash inventory changes. This enterprise account is a complete compilation of all costs and returns associated with this specific beef cow profit center.

As a result of these two resource evaluation schemes, both an economic bottom line and a cash flow bottom line need to be prepared in a beef cow profit center analysis. The economic bottom line is the earned returns (value added) to the family's three contributed resources – unpaid family and operator labor, management, and equity capital. The cash flow bottom line is the net cash flow associated with the beef cow profit center. The net cash flow per cow should be after debt service and family living draw. The net cash flow bottom line is used in determining the economic value of a bred heifer.

The third economic principle needed in determining the economic value of a bred heifer is the time value of money. The time value of money suggests that money in hand is worth more than money to be realized at some future point in time.[1] This implies that current revenues are more valuable than future revenues and that current expenses are more costly than future expenses.

There are three basic reasons as to why there is a time value of money.[1] First, money has alternative productive uses. Second, inflation means that the purchasing power of future dollars is less than the purchasing power of current dollars. Third, we live in a world of uncertainty. The further we project into the future, the greater the likelihood of some adverse event preventing us from realizing these future dollars. Bringing bred heifers into a breeding herd fits all three of these economic conditions.

We are all familiar with compounding – what happens in savings accounts when interest is added. Discounting is the opposite. Discounting strips interest from a future amount to get a present value.[c]

Net present value is the discounted value of the net cash flow generated by an investment minus the initial capital outlay. In determining the economic value of a heifer, the initial capital outlay is set to zero so that the net present value gives the breakeven initial capital outlay for a bred heifer. Net present value is my rec-

Step 1. Develop a set of long-run planning prices.

Step 2. Prepare a beef cow Profit center budget.

Step 3. Project salvage value for cull cows.

Step 4. Determine the appropriate discount rate.

Step 5. Calculate the net present value of the heifer.

Step 6. Adjust the economic value for different lifetime number of calves produced.

Figure 2. Six steps for projecting economic value of heifer.

ommended economic tool for calculating the economic value of a bred heifer.

The Six Steps in Determining the Economic Value of a Bred Heifer

There are six recommended steps in calculating the economic value of a bred heifer (Figure 2). The first step is to develop a set of calf planning prices for the expected life of the bred heifer in that specific cow herd. For this analysis, I will assume that a bred heifer will have seven consecutive calves starting with a 1998 spring-born calf that is bred in 1999 and will have her first calf in year 2000. Annual calf planning prices are needed for years 2000 through 2006.

The second step in determining the economic value of a bred heifer is to prepare a beef cow profit center's cash flow budget for each of the seven years that this heifer is projected to calve. The third step is to project the salvage value of the cull cow at the end of the seventh year. The fourth step is to determine the appropriate discount interest rate to utilize in calculating the time value of money. The fifth step is to calculate the Net Present Value of the bred heifer. The sixth and final step is to adjust for different numbers of life-time calves produced. Let's now apply these steps to a case example.

A Case Example

Step 1: Preparing a set of planning prices

Beef cow producers find the development of a set of planning prices one of the most difficult and complex tasks of the planning process. As a result, many beef cow producers use current prices to evaluate the economic value of bred heifers. The problem is that beef prices go in cycles corresponding to the cattle cycle; and as a result, today's cash prices are poor proxies for long-run planning prices.

North Dakota Calf Prices

Harlan's Long-Run Projections for 500-600 lbs (1999)

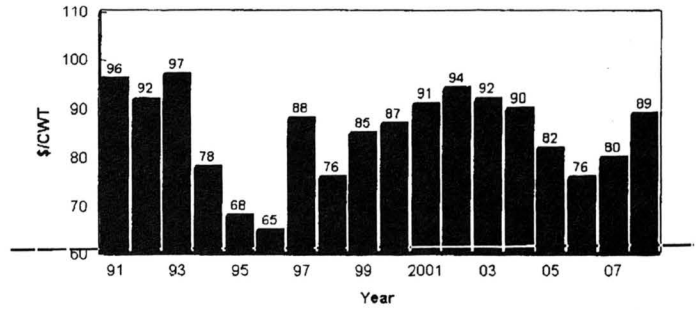


Figure 3. Calf planning prices.

Figure 3 presents a suggested set of long-run steer calf planning prices. This set of planning prices corresponds to the cattle cycle forecast by FAPRI.[d] Veterinarians are encouraged to use these planning prices. I continue to update these planning prices on my web site www.ag.ndsu.nodak.edu/cow.

Today, we are on the upward phase of the current 1996 to 2006 beef price cycle. The approximately 10-year beef price cycle goes from the low point in 1996 to a projected low point in year 2006. Heifers bred for the first time during 1999 are projected to produce calves selling at $87 in year 2000, increasing to $94 in 2002 and decreasing back to $76 in 2006 (Figure 3). The economic value of a bred heifer is highly influenced by where in the beef price cycle the heifer starts producing calves. Heifers born during the beef price cycle's low-price phase tend to produce calves during the high-price phase and heifers born during the high-price phase tend to produce calves during the low-price phase.

Table 1. Reproduction and production summary.

Calculated SPA production and economic measures		
Reproduction: ND-Demo-160 Cow Herd		Year: 1998
SPA adjusted females exposed	178	Head
Pregnancy percentage	93%	
Calving percentage	87%	
Calf death loss (% of born live)	5%	
Percent calf crop	87%	
Production:		
Actual weaning weight	565 lbs	
Steers	579 lbs	
Heifers	548 lbs	
Total pounds of calf produced	87058 lbs/head	
Average calf age (days = 180)	6.00 months	
Weight per day of age_1/	3.14 lbs	
Pounds of weaned calf per exposed female	489 lbs	

Step 2: Preparing a cash flow budget for example herd

This herd includes 166 cross bred cows on a North Dakota diversified crop and livestock farm.[e] The operator also farms 1,200 acres of cropland. The 1998 reproduction and production performance of this herd is presented in Table 1. Percent calf crop in 1998 was 87 percent and the pounds weaned per female exposed in 1998 was 489 pounds.

The marketing summary for this case herd is presented in Table 2. Steers weighing 565 pounds were sold at weaning for $76 per hundredweight. Heifer calves sold for a $5 per hundredweight price discount to steer calves. Due to the average $4.58 market price slide in North Dakota during the fall of 1998, the value of added weight at weaning time was $51 per hundredweight.[f]

The economic performance of this herd is presented in Table 3. This herd grossed $401 per cow in 1998 and had economic production costs of $352 per cow leaving an earned return to unpaid family and operator labor, management, and equity capital (Net Pre-Tax Income) of $49 per cow. After adjusting for interest paid and using the $90 family living draw as a proxy for labor and management charge, the earned return on the $2,088 per cow capital investment was zero.[g]

Table 2. Market report.

Marketing:	
Breed	X bred
Marketing method	sale barn
Pay weight dollars for steer calves	$76.00/cwt
Heifer price differential _1/	$5.00/cwt
Price slide differential _1/	$-4.58/cwt
Value of additional weight _1/	$50.88/cwt

Table 3. Economic summary.

Economic performance:	
Accrual income	$401/cow
Production cost of feed fed	$188/cow
Grazing costs	$77/cow
Non-feed costs	$87/cow
Total production costs	$352/cow
Financing interest	$40/cow
Principal payment $16.11	xxxx/cow
Net pre-tax income (P&L)	$49/cow
Percent return on assets:	
Cost basis	_____/cow
Market value (fl =$90)	0%/cow
Unit costs of production:	
Financial	_____/cwt
Economic	$68.80/cwt
Cash costs _1/	$77.05/cwt

The unit cost of producing a hundredweight of calf was $68.80 and the market price received was $76.00 for an earned economic return of $7.20 per hundredweight of calf produced. The cash costs of producing a calf was $77.05 per hundredweight resulting in a negative net cash flow of $27 per cow in 1998. As you can see, times were tough in cow country in 1998.

Table 4 presents the 1998 cash flow and economic summary for the study herd's beef profit center. Gross cash income generated was $379 per cow, cash production expenses were $316 per cow before family living draw. Given the $90 per cow family living draw, net cash income per cow was a negative $27 per cow. This cash flow and economic summary of this herd is typical of what I found for 1998. Earned economic returns per cow was typically positive but cash flow was typically still negative in 1998. In this case, net cash flow before family living is projected to start out at $106, increase to $136 and decrease back down to $54 in year 2006.

Table 5 presents the projected net cash flow of this herd throughout the rest of the current cattle cycle (2000 through 2006). These are the budgets that will be used to calculate the economic value of a bred heifer. Net cash flow, after family living, is projected to range from $16 per cow in year 2000, increase to $46 per cow in 2002, and turn downward to a minus $36 per cow in 2006. Net cash flow, before family living, however, is what is used to determine the economic value of a bred heifer.

Step 3: Projecting cull salvage value after 7 calves

The Food and Agricultural Policy Research Institute (FAPRI) also provides long-run projections of cull cow prices and these prices are presented in Figure 4. Again, cull cow prices run in 10-year cycles with the lows in the mid-part of each decade. We are now in the upward portion of the current cull cow price cycle. Just like the long-run calf planning prices presented in Figure 3, the magnitude of the current projected cull cow planning price cycle has also been tempered by increased production per cow, lack-luster beef demand, and increased competition from other meats.

Projected nominal prices in the next decade are less than prices in the last decade. Cull cow prices during the current beef price cycle are projected to run from a low of $30 per hundredweight in 1996, to a high of $43 in year 2002, and back down to $36 per hundredweight in 2006. This projects that a 1,200 pound cull cow will sell for $360 in 1996, $516 in year 2002, and $432 in 2006.

Step 4: Determine the appropriate discount rate

The most difficult aspect of calculating the economic value of a bred heifer is determining the appropriate discount interest rate. This example herd

Table 4. Cash flow and economic summary.

1998 value added to farm/ranch family's contributed resources Jan 1 inventory= 166 cows	females exposed = 191	
$2,088 total inv/cow $508 total debt/cow $76 steer pr $71.93 cash/cwt 565 # ave wn wt. Gross income/cow	per cow, January 1 Cashflow $379	 Economic $401
Feed costs:	$21	$77
Summer	$0	$0
Aftermath	$169	$188
	$190	$265
Livestock expenses:		
Vet & medicine	$21	$21
Trucking	$0	$0
Miscellaneous	$0	$0
Fuel	$7	$7
Utilities	$4	$4
AI expense	$0	$0
Livestock supplies	$3	$3
Marketing	$8	$8
Breeding	$4	$13
Hired labor or mgt	$0	$0
	$46	$55
Interest on feed & l.s. exp	$0	$0
Fixed expense:		
Bld, fac, cows & heifers	$23	$29
Debt interest	$40	$4
Debt principal	$16	xxxx
Total costs	$316	$352
Net cash flow before family living	$63	xxxx
Family living draw	$90	xxxx
Net cash income before tax/cow	$-27	xxxx
Net value added income (p&l)	xxxx	$49
Cost of production_1/cwts steer equivalents=>	$77	$67

__1/ per cwt calf produced based on cwt steer equivalent basis.

manager has money borrowed for pasture land at 9 percent. If he did not invest in additional heifers, he could apply that money toward the 9 percent pasture land note. The appropriate discount rate should be around this 9 percent interest rate adjusted for after-tax.[h] I elected to use an 8 percent discount factor in this paper.

Step 5: Calculate the net present value of a bred heifer

Table 6 presents a simple spreadsheet used to take the projected annual net cash flows and calculate the economic value of a bred heifer. The net income column presents the net cash flows before family living generated in the seven annual budgets for the beef cow profit center. The middle column presents the appropriate discount rate. The right-hand column presents the annual discounted net cash flows before family living. The cull cow salvage value is added at the end of the time period.

Net cash income is projected to total $1,143 dollars per cow spread over the seven years. When the selected 8 percent discount rate is applied to each year's annual net income, the calculated net present value of a bred heifer is $783.

Table 5. Long-run cash flow projections.

	Herd projections through time						
Item	2000 Cashflow	2001 Cashflow	2002 Cashflow	2003 Cashflow	2004 Cashflow	2005 Cashflow	2006 Cashflow
Cash inc	$422	$439	$452	$443	$432	$397	$370
Pasture	$21	$21	$21	$21	$21	$21	$21
Aftermath	$0	$0	$0	$0	$0	$0	$0
Winter	$169	$169	$169	$169	$169	$169	$169
Feed cost	$190	$190	$190	$190	$190	$190	$190
Vet & med	$20.55	$20.55	$20.55	$20.55	$20.55	$20.55	$20.55
Trucking	$.00	$.00	$.00	$.00	$.00	$.00	$.00
Misc	$.00	$.00	$.00	$.00	$.00	$.00	$.00
Fuel	$6.60	$6.60	$6.60	$6.60	$6.60	$6.60	$6.60
Utilities	$4.06	$4.06	$4.06	$4.06	$4.06	$4.06	$4.06
AI cost	$.00	$.00	$.00	$.00	$.00	$.00	$.00
Supplies	$2.64	$2.64	$2.64	$2.64	$2.64	$2.64	$2.64
Marketing	$7.92	$7.92	$7.92	$7.92	$7.92	$7.92	$7.92
Breeding	$4.24	$4.24	$4.24	$4.24	$4.24	$4.24	$4.24
Hired lab	$.00	$.00	$.00	$.00	$.00	$.00	$.00
Tot L.S.	$46	$46	$46	$46	$46	$46	$46
OP int	$.00	$.00	$.00	$.00	$.00	$.00	$.00
Fixed cost	$22.87	$22.87	$22.87	$22.87	$22.87	$22.87	$22.87
Inv int	$40.41	$40.41	$40.41	$40.41	$40.41	$40.41	$40.41
Princ pmt	$16.11	$16.11	$16.11	$16.11	$16.11	$16.11	$16.11
Total costs	$316	$316	$316	$316	$316	$316	$316
Net cash	$106.60	$122.73	$136.23	$126.77	$115.92	$80.86	$53.88
Fam living	$90	$90	$90	$90	$90	$90	$90
Net cash	$16	$32	$46	$36	$26	$-9	$-36
Unit cost	$80	$80	$80	$80	$80	$80	$80

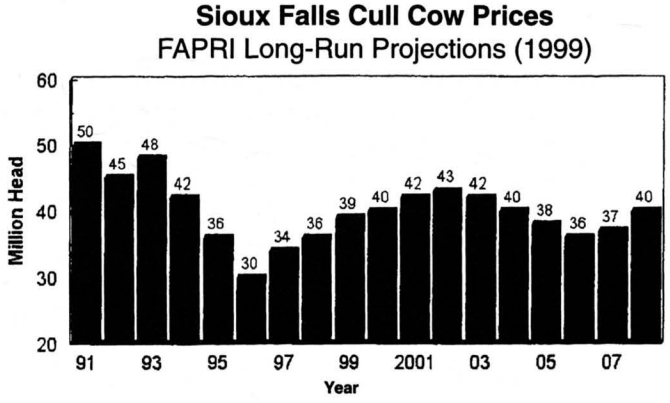


Figure 4. Long-run cull cow prices

What does the $783 economic value tell us? It suggests that if this beef cow producer paid $783 dollars for this bred heifer at the end of the 1999 grazing season, the $783 dollar investment in a bred heifer is projected to earn eight percent return on that investment. If this beef cow producer pays more than $783 dollars for this bred heifer, he is projected to earn less than 8 percent return on his investment. If he pays less than $783 for this bred heifer, he is projected to earn more than an eight percent return on his investment.

Table 6. Spreadsheet for calculating net present value.

What a beef cow is worth				
Year of economic analysis		2000		
	Year	Discount Net income	Discount Factor_1/	Value
1	2000	$106.00	.9259259	$98.15
2	2001	$123.00	.8573388	$105.45
3	2002	$136.00	.7938322	$107.96
4	2003	$127.00	.7350299	$93.35
5	2004	$116.00	.6805832	$78.95
6	2005	$81.00	.6301696	$51.04
7	2006	$54.00	.5834904	$31.51
Value cull cow===>		$400.00	.540269	$216.11
Discount interest rate===>			8.00%	$782.52
Total undiscounted net cow income=>			$1,143	
Maximum projected value of a cow==>			$783	

_1/ Discount Factor is 1/(1+i)^YR

Step 6: Adjust economic values for alternative life-time calves

While the $783 economic value of a bred heifer assumes that she will produce seven consecutive calves in her life time, North Dakota's Cow Herd Analysis and Performance System (CHAPS) indicates that a significant number of 3-, 4-, and 5-year old cows are culled. Many females do not stay in a herd to produce seven consecutive calves. Let's use this economic analysis to evaluate the economic impact of early culling of this bred heifer.

The most critical case is the 3-year old that does not breed back. What is the economic impact of a 3-year old not having a calf? What if she breeds back at 4 and continues through the rest of her productive life?

Table 7 presents the net present value for a bred heifer that does not breed back as a 3-year old, but she does produce consecutive calves as a 4-year old to 9-year old. Note that the annual net cash flow for the second year is a negative $286. This represents that cash cost of keeping her around for that year so that she can breed back as a 4-year old. The assumption is that she produced one calf as a 2-year old in year 2000, was open in 2001, returned to producing calves in 2002 through 2006. The calculated net present value is $432. This is a reduction of $351 ($783 to $432) in net present value of a bred heifer by missing the second calf. This clearly demonstrates the economics importance of getting 3-year old heifers re-bred.

The calculated net present value of a heifer having one calf and then being culled because she is open, is $475. My analysis suggests that selling the open 3-year old as a cull cow is more profitable than keeping her and having her calf as a 4 to 9 year old. This conclusion, however, does depend on where one is in the beef price cycle. If the high beef prices were later in the life of the heifer, the answer might be different. Culling recommendations need to take the beef price cycle into account.

Let's now assume that this heifer calves consecutively, but her number of life-time calves are less than seven. Figure 5 illustrates how the calculated economic

Table 7. Net present value for multiple life-time calves.

What a beef cow is worth						
Year of economic analysis			2000			
			7 calves	Open 3yr	6 calves	5 calves
Value cull cows		Year	Net income	Net inc	Net inc	Net inc
$40.00	1	2000	$106.00	$106	$106	$106
$42.00	2	2001	$123.00	$-286	$123	$123
$43.00	3	2002	$136.00	$136	$136	136
$42.00	4	2003	$127.00	$127	$127	$127
$40.00	5	2004	$116.00	$116	$116	$116
$38.00	6	2005	$81.00	$81	$81	$440
$36.40	7	2006	$54.00	$54	$418	$0
$36.10		Value cull cow ===>	$400.40	$400	$0	$0
		Interest discount rate ===>	8.00%	8.00%	8.00%	8.00%
		Total undiscounted net cow inc =>	$1,143	$734	$1,107	$1,048
		Maximum projected value of a cow=>	$783	$432	$779	$761

Step 6: Adjust for Different Life-time Calf Production
Born 1998. Bred 1999, 1st Calf Year 2000

Animal	Life-time	Econ value
Bred heifer	7 calves	$783
"	No 2nd calf	
"	1 calf only	$475
Bred cow	6 calves	$779
"	5 calves	$761
"	4 calves	$719
"	3 calves	$673
"	2 calves	$587
"	1 calf	$475

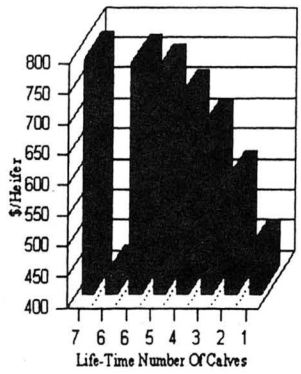


Figure 5. Economic value by life-time production.

value of a bred heifer varies with the life-time number of calves produced. The calculated economic value of a bred heifer that produces six consecutive calves is $779 – only $4 less than one having seven consecutive calves. Remember that changing annual salvage value of cull cows has some impact on this and certainly, the time value of money has a major impact. Even a bred heifer that produces five consecutive calves has a net present value of $761 – down only $22 from seven consecutive calves. A bred heifer that has four consecutive calves has a net present value of $716 – down $64. Three consecutive calves went to $673, two consecutive calves went to $587 and a heifer having one calf and then culling at next year's pregnancy check, had a net present value of $475. Again, remember that these relative economic values are specific as to where we start this analysis in the cattle cycle. The key here is: are calf prices high early or late in the bred heifer's life time? This discussion focuses on the situation were calf prices are high early in her productive life time.

One final point, how sensitive are these calculated economic values to changes in the input numbers? Space prohibits most dialog but let me say that a 10 percent increase in all incomes raised the economic value 10 percent. A 25 percent increase in cull cow income raised the economic value by 7 percent. A one percent increase in the discount rate reduced the economic value by 4.2 percent.

Summary

The primary purpose of this paper was to present a recommended process that ranchers and beef farmers might utilize to evaluate the value of breeding stock – in this case the economic value of a bred heifer at pregnancy check time, Fall 1999. This paper outlined a six-step process for projecting the present economic value of a bred heifer that would be brought into a beef cow herd. Step 1 developed a set of long-run planning prices. Step 2 prepared a beef cow profit center budget, Step 3 projected a salvage value for cull cows, Step 4 determined the appropriate discount rate, Step 5 calculated the Net Present Value of the heifer, and Step 6 adjusted the economic value for different life-time numbers of calves produced. These six steps were then applied to a North Dakota case herd. Figure 5 summarizes the calculated economic value of a bred heifer that has her first spring born calf in year 2000.

The initial focus was on the economic value of a bred heifer that produces seven consecutive calves. In this example, the projected Fall 1999 economic value for a bred heifer that produced seven consecutive calves was $783. This translates into saying that a bred heifer purchased for $783 this Fall is projected to earn 8 percent return on the $783 investment. This specific economic value is based on a specific herd operating in the turnaround and early expansion phase of the cattle cycle.

This process was further generalized to project the economic value of bred animals with different life-time expectations as they come into the herd. The results of these calculations are also graphed in Figure 5. Due to where we are in the current beef price cycle, the economic impact of producing fewer life-time calves was relatively small. The one exception was for a heifer that had one calf and then was open as a three year old.

The calculated net present value of a heifer having one calf and then being culled because she is open, was $475. My analysis suggests that selling the open 3-year old as a cull cow is more profitable than keeping her and having her calf as a 4 to 9 year old. This conclusion, however, does depend on where one is in the beef price cycle. If the high beef prices were later in the life of the heifer, the answer might be different. This keep/sell conclusion should also be tempered by the cost of bringing in another replacement which is beyond the scope of this paper. The point of this paper is that culling recommendations need to consider the beef price cycle.

The economic value of a bred heifer is projected to change as we progress through the cattle cycle. My calculated economic values for bred heifers have already peaked in the current cattle cycle. Typical beef cow producers (as of summer 2000) have not yet seriously began to expand their beef cow herds. They are projected to do so with year 2000 heifer calves.

In summary, a bred heifer today is worth all of her future annual net incomes, including her future cull value, discounted back to today's dollars. Conceptually, this is easy to do and microcomputers make the calculations relatively simple. The most difficult aspect, however, is the gathering all the needed information.

My final conclusion is that profitable heifer management strategies must take the cattle cycle, and the resulting beef price cycle, into account. Timing of heifer retention is critical.

Footnotes

[a] One reviewer asked if ranchers should reduce calf production as I stated in the above sentence or should ranchers just focus on the timing of replacement investments and cull sales. I need more research before I can give a very specific answer. For now, I am going to suggest that my original statement holds.

[b] Opportunity costs say that the beef cow profit center has to pay the same amount for farm raised forages consumed that his neighbors would pay for the forage; i.e., opportunity cost is the local fair market price of the forage.

[c] This present value in equation (1) will be used to calculate the economic value of a bred heifer. Solving equation (1) for Present Value (PV) gives equation (2).

(1) Future Value = Present Value x Interest Factor

(2) PV = FV/(1+i) where i is annual interest rate.

If equation (2) is generalized for multiple years (n), then the Present Value Equation becomes:

(3) $PV = FV/(1+i)^n$ where (n) is the number of years.

[d] These prices are based heavily on Iowa State University and University of Missouri Food And Agricultural Policy Research Center (FAPRI) long run price forecasts published in "FAPRI 1999 U.S. Agricultural Outlook", Jan 1999, pg 99. These North Dakota prices, however, are my projections and not FAPRI projections.

[e] The example herd used in this paper is a composite of two actual herds modified to meet data confidentially. I have permission from these two producers to release this data.

[f] With the typical negative price slides in feeder calf markets, the value of added weight is always less than the average price. How much less depends on the magnitude of the price slide. In this case, the value of added weight was 50.88 cents per pound. This 50.88 cents is what should be used to value the added weight from output increasing technologies or production practices. Creep feeding calves is an example. The common error in evaluating creep feeding is to use average market price.

[g] Capital investment includes the investment in beef cow breeding herd, beef cow equipment, beef cow facilities, and pasture land. It does not include machinery investment used to harvest farm raised feeds fed to the beef cows. It does include that portion of machinery used to feed the cows.

[h] Gale Willet, "Financial Analysis Of Investments In Agricultural Capital Assets," Videotape Script And Exercise, pg 16.

Reference

1. Willet, G. Financial analysis of investments in agricultural capital assets. Department of Agricultural Economics, Washington State University. p 9, 1992.