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How Much Debt Will A Beef Cow Support?

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The 1987 run-up in beef cattle prices has made many North Dakota cattlemen interested in expanding their cow herds. Reports are being received that as beef cow prices go up, it gets easier and easier to borrow investment capital for additional cows. Today's management challenge, however, is not in obtaining investment capital for additional beef cows. Today's challenge is in ensuring that cattlemen do not become overly optimistic, bid away all the profit potential, and borrow more investment capital than can be repaid by the additional cows. The purpose of this circular is to discuss two recommended economic evaluations that a cattleman should go through in evaluating the decision to buy additional beef cows.

cash flow associated with the investment. **Both profitability and feasibility have to be positive and each should be independently evaluated before a cattleman invests in additional beef cows.**

Evaluating the profitability and feasibility of additional beef cows requires the development of long-range (four years or more) beef cattle planning prices. Optimism is returning to the cattle industry. The beef cattle price cycle has started upward and is projected to be favorable for the next few years. This author is suggesting an $80 average planning price for 450-pound calf prices over the next four years. The key assumption behind this $80 planning price is that the 1985 Farm bill will remain unchanged.

"Profitability" and "Feasibility" — Two Separate Analysis

A cattleman thinking about adding beef cows should first determine the projected economic "profitability" of the additional cows. Projected economic costs need to be compared to the projected income from the additional cows. If the investment appears to not be profitable, then do not invest in additional cows. If the investment looks to be profitable, then do a second projection evaluating the "feasibility" of investing in additional beef cows. Feasibility projects the net

Profitability Analysis

A profitability analysis can be done through the conventional budget familiar to most livestock producers. Resources are valued at the opportunity cost of using the resources in their next best use. For example, if the market price for hay is $50 per ton, then the beef cow enterprise is charged $50 per ton for the hay consumed. All production costs are based on this opportunity cost concept. A typical long-range beef cow budget is presented in Appendix 1. Please note that the profitability analysis is presented on the right-hand side of the budget. Projected returns to operator labor, management, and equity capital is $71 per cow per

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year. The general conclusion drawn from the $71 is that additional beef cows project to be profitable.

Feasibility Analysis

Feasibility analysis is based on only "out-of-pocket" costs. For example, while opportunity cost of pasture is budgeted on the profitability side at $7.00 per animal unit month (AUM), the feasibility side reflects only a $0.50 cost per acre. The pasture is assumed owned by the producer so that the only out-of-pocket costs are land taxes, fence repair and water costs. A debt free herd will have considerably lower out-of-pocket cash costs than will a highly leveraged beef herd. The higher the equity financing, the lower the out-of-pocket costs.

The projected total cash income for this typical beef cow herd is $303 per cow while the projected total cash costs is $114 per cow (see left-hand side of beef cow budget in Appendix 1). For now, no family living draw from the cow herd is assumed; therefore, the projection is that a maximum of $189 per cow remains available from a debt-free herd for annual debt repayment.

How Much Debt Can A Beef Cow Generating $189 Cash Per Year Support?

The economic logic that can be utilized to answer the question of how much debt a beef cow can support is rather straightforward. We can use the bottom line of the feasibility figures (left-hand side) of the budget in Appendix 1 to determine our projection of cash available for additional debt payments. The question that we must try to answer is how much cow debt can be supported with a combined $189 principal and interest payment per year.

The maximum debt that can be supported by an annual $189 payment can be estimated by first calculating an "amortization factor" (AMF) and then dividing the annual payment by the AMF. The equations are:

$$A = \text{(interest rate)}/100$$
$$B = (1 + A) \blacktriangleleft \text{(loan period)}$$
$$C = (1-(1/B))/A$$
$$AMF = 1/C$$
$$\text{(max loan)} = \text{(cash available)}/AMF$$

where ◄ signifies raised to a power.

Using the $189 example calculated above:

$$A = 11.25/100$$
$$= .1125$$

$$B = (1 + A) \blacktriangleleft \text{(LOAN PERIOD)}$$
$$= 1.1125 \blacktriangleleft (7)$$
$$= 2.1091142$$

$$C = (1-(1/B))/A$$
$$= (1-(1/2.1091142))/.1125$$
$$= (1-(.4741326))/.1125$$
$$= .5258674/.1125$$
$$= 4.674375$$

$$AMF = 1/C$$
$$= 1/4.674375$$
$$= 0.2139323$$

$$MAX \ LOAN = \$189/0.2139323$$
$$= \$883.46$$

This set of equations suggests that a beef cow providing $189 per year toward additional debt payment will support a loan of $883 for seven years at 11.25% interest. The numbers above have been entered into the worksheet in Table 1 to illustrate how cattlemen can analyze their own unique situations.

How Does Family Living Draw Affect The Maximum Debt?

If $50 per cow per year is used for family living draw, the $189 available for debt repayment is reduced to $139 per cow. The maximum debt that the beef cow can now support is $650 per cow — $233 less due to the $50 per cow per year family living draw. A $100 per cow for family living draw reduces the maximum debt that can be supported to $416 per cow. **Clearly, family living draw has a dramatic impact on how much debt a beef cow car support; therefore, since family living draw varies from farm to farm, the maximum debt that can be supported varies from farm to farm.**

Since land is generally financed over considerably more years than cows, the $189 per year would support more land debt per cow. For example, the $189 available cash per year could support a 30-year land debt of approximately $1600 per cow. This assumes that the cow and associated equipment are all financed with equity capital. In reality, both land and cows are frequently financed. The $189 per cow per year could simultaneously finance a $1000 land debt over 30 years and a $335 cow debt over seven years. When a ranch unit sells for $1200-$2000 per animal unit, it is clear a substantial portion of the sale price has to be financed with equity capital. A beef cow simply can not generate sufficient cash flow to allow 100 percent financing.

Table 1. MAXIMUM BEEF COW DEBT WORKSHEET

1. GROSS INCOME/COW
(A) $ _303_ /COW

2. CASH EXPENSES/COW:

    A. CASH FEED COSTS $ _54.79_

    B. VET & MEDICINE $ _8.50_

    C. COST OF FLY TAGS $ _3.50_

    D. SUPPLIES $ _4.00_

    E. UTILITIES $ _2.60_

    F. POWER & FUEL $ _5.50_

    G. MARKETING COSTS $ _8.00_

    H. BREEDING COSTS $ _15.00_

    I. DIRTI $ _12.09_
       (Depreciation, Interest, Repairs, Taxes and Insurance)

    J. INTEREST ON OPERATING CAPITAL $ _0_

    K. FAMILY LIVING DRAW $ _0_

                TOTAL   (B)$ _113.98_

3. MAXIMUM DOLLARS FOR DEBT SERVICE PER COW
(C)$ _189_

4. MAXIMUM TOTAL DEBT SERVICE AS PERCENT OF GROSS INCOME
(C/A x 100) _62_ %

5. INTEREST RATE FOR COW LOAN
_11.25_ %

6. LOAN PERIOD FOR COW LOAN
_7_ YRS

7. CALCULATING AMORTIZING FACTOR:

    A = INTEREST RATE/100   _11.25_ /100 = _.1125_

    B = (1 + A) ◄ (Loan Period)   (_1.1125_) ◄ (_7_) = _2.109114_

    CCC = (1/B)   (1/ _2.109114_) = _.4741327401_

    CC = (1-CCC)   (1- _.4741327401_) = _.5258672b_

    C = (CC/A)   (_.525867_ / _.1125_) = _4.6743756b_

    AMF = 1/C   (1/ _4.674375_) = _.2139323146l_

8. MAXIMUM LOAN = (CASH AVAILABLE/AMF) = (_189_ / _.21392315_) = $ _883_

A Word Of Caution

While the current price cycle (1987) indicates favorable calf prices for the next few years, cattlemen are cautioned that the current favorable price cycle will invariably lead to a buildup in cattle numbers. A buildup in cattle numbers will, in turn, lead to a downturn in prices. Astute cattlemen will be planning for a price downturn in the late 1980's or early 1990's at the latest. Cattlemen are encouraged to have their additional beef cows paid for before the downturn in prices occurs, which would favor financing additional 1988 cow purchases with four-year financing rather than the more traditional seven-year financing. If the $189 repayment is used to finance a four year loan with 11.25% interest, a beef cow is projected to support a maximum debt of $583 per cow (see Table 2).

Cattlemen thinking about expanding their cow herds with borrowed capital are encouraged to calculate their own figures.[1] Remember to look at both the profitability and the feasibility. Profitability depends heavily on the beef cattle price cycle and the production level of the cows while feasibility depends heavily on the amount of borrowed capital and the productivity level of the cows. While some potential exists for profits in the next three-four years, astute cattlemen will not borrow more additional capital than what the additional cows can repay.

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[1]Another method of expanding is keeping open cows five years of age and under. It is suggested that open heifers be culled. This assumes that open cows can be rebred and that failure to conceive is due to poor nutrition and not other problems. Producers are cautioned, however, that expanding by keeping open cows is a slow way to expand so that the expanded herd may be at full capacity just as cattle prices go down.

Table 2. Maximum Debt That A Beef Cow Can Service (4 Years, 11.25%, 85% Calf Crop, and $0 Family Living Draw)*

FEEDER STEER PRICE	AVERAGE STEER CALF WEANING WEIGHT				
	400	450	500	550	600
$/CWT	($/COW)				
65	389	451	515	580	642
70	426	497	565	633	701
75	467	540	614	688	762
80	503	583	663	741	821
85	546	630	713	796	883

*Simulation runs with "Maximum Debt A Beef Can Support", a microcomputer program designed by Harlan Hughes, Extension Livestock Economist, North Dakota Cooperative Extension Service and Harry Crim, Farm Management Consultant, Fort Collins, Colorado.

APPENDIX 1. LONG RANGE BEEF COW ENTERPRISE BUDGET FOR 1987-1991

BEEF COW HERD SELLING WEANED CALVES IN FALL 1987-1991
DATE: 7/5/87

DESCRIPTION

A spring-calving 100-cow herd wearning 85% calf crop. Heifer calves weigh 420 lbs. and steer calves weigh 450 lbs. Cow death loss of 1% and 12% bred heifer replacement. Calculated heifer calf-crop 77%. Feed requirements include 100 cows and 17 replacement heifers. Three bulls are assumed. Calves sold in the fall at 5-8 months old with a 4% transit shrink. Cows on pasture 180 days with 30 additional days on aftermath.

RECEIPTS

Steer calf	43 head	432 pounds	$.80 /lb =	$14,688
Heifer calf	26 head	403 pounds	$.75 /lb =	7,747
Cull cows	12 head	900 pounds	$.45 /lb =	4,860
Cull Heifers	4 head	875 pounds	$.68 /lb =	2,310
Cull Bull	1 head	1700 pounds	$.45 /lb =	729
TOTAL				$30,334

FEED EXPENSE

CASH FLOW BUDGET[1] (Feasibility)		180 Day Summer Pasture Program				OPPORTUNITY COST[2] (Profitability)
$390	$.50	Pasture	780.16	AUMs	$7.00/AUM =	$5,461
$395	$400.00	Min&salt	.99	ton	$400.00/ton =	$395
$300	xxxxxxx	Fence & Water		($/herd)	xxxxxxxxxx	$300

		155 Day Winter Feeding Program				
$164	$.75	Oats	218.0	bushels	$1.40/bu =	$305
$350	$140.00	Protein	2.5	ton	$140.00/ton =	$350
$3,375	$15.00	Hay	225.0	ton	$40.00/ton =	$9,000
$0	$10.00	Corn Silage	.0	ton	$17.00/ton =	$0
$0	$5.00	Oat Straw	.0	ton	$20.00/ton =	$0
$406	$400.00	Min&salt	1.01	ton	$400.00/ton =	$406
$100	$.03	Aftermath	30	days	$.10/day =	$300
$5,479						$16,516

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[1] The feasibility side of the budget represents the "out-of-pocket costs" associated with the beef cow herd. For example, while opportunity cost of pasture is budgeted on the profitability side at $7.00 per animal unit month (AUM), the feasibility side reflects a pasture owned by the producer so that the $0.50 out-of-pocket costs are for land taxes, fence repair and water costs.

[2] The profitability side of the budget represents total economic cost analysis typically done through the conventional budgeting process familiar to most livestock producers. Resources are valued at the opportunity cost of using the resources in their next best use. For example, if the market price for hay is $50 per ton, then the beef cow enterprise is charged $50 per ton for the hay consumed. All production costs are based on this opportunity cost concept.

LIVESTOCK EXPENSES

$850	Vet and Medicine	$8.50/cow	$850
$350	Fly Tags	$3.50/cow	$350
$400	Supplies	$4.00/cow	$400
$260	Utilities	$2.60/cow	$260
$550	Power and Fuel	$5.50/cow	$550
$800	Marketing	$8.00/cow	$800

Bull Depreciation

	$0.00 Loan	a: purchase price	$1500.00/bull	
Loan Pmt	12% APR	b: salvage price	$600.00	
$0	3 yrs	c: years of use	3.00	$857
$1,500	xxxxxx	d: cash pmt for new bulls	xxxxxx	xxxxxx

$0		Bedding	$2.00/cow	$200
$0	0%	Interest Feed & Lvstk	.00% @ 6 Mo	$0
$4,710				**$4,267**

FIXED EXPENSES

Depreciation, Repairs, Taxes & Insurance

$100	2% Total Bldg Invest	$5,000	7% rate =	$350
$300	3% Total Eqmt Invest	$10,000	13% rate =	$1,300
700	1% Investment /cow	$700	1%	$700
$66	1% Heifer investment	$550	1%	$93
$43	1% Bull Expenses	$4,286	1%	$43
xxxx	Total Inv/Cow	$986	xxxxx	xxxxxx

Loan Pmt	Borrowed Investment Capital @ Int		Rate	Years	xxxx
$0	$0 Total Bldg Invest	$5,000	12%	15	xxxx
$0	$0 Total Eqpt Invest	$10,000	12%	10	xxxx
$0	$0 Investment/Cow	$700	12%	7	xxxx
$0	$0 Investment/Heifer	$550	12%	7	xxxx
xxxx	xx Average Bull Inv	$3,000	xxx		xxxx
$1,209					**$2,486**

-- RETURNS --

$30,334	Receipts	$30,334
$10,189	Less Feed and Livestock Expenses	$20,784
$20,145	Returns Above Variable Costs	$9,550
$1,209	Less Fixed Expenses	$2,486
xxxxxx	Returns to Labor & Mgt, & Equity Capital Per Herd	$7,064
xxxxxx	Returns to Labor, Mgt, & Equity Capital Per Cow	$71

ADJUSTMENTS FOR MULTIPLE PRODUCTS

$113.97	Total Cost Per Cow (EXC L, M, & EQ CAP)	$232.69
379.17	Cwts of steer equivalents sold	379.17
$26.87	Cost Per Hundred Weight Sold (Feed + LS Exp)	$54.81
$30.06	Cost Per Hundred Weight Sold (All Costs)	$61.37
xxxx	Returns to Labor, Mgt, & Equity Capital/Steer Equiv	$18.63
$.00	Family Living To Be Supported From Cow Herd	xxxx
$18,936	Cash Available To Pay Additional Debt From Herd	xxxx
$189.36	Cash Available To Pay Additional Debt Per Cow[1]	xxxx

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[1] This analysis assumes that all cow debt is spread evenly over all cows in the inventory. The $189.36 is the cash available from each cow in the inventory. If a cattleman is adding additional cows to an existing herd, I suggest that the new marginal debt be divided among all cows (old and new) to look at the average debt over the herd.

APPENDIX 2. WORKSHEET FOR CALCULATING MAXIMUM DEBT A BEEF COW CAN SUPPORT.

1. GROSS INCOME/COW   (A) $_____/COW

2. CASH EXPENSES/COW:

    A. CASH FEED COSTS $_____

    B. VET & MEDICINE $_____

    C. COST OF FLY TAGS $_____

    D. SUPPLIES $_____

    E. UTILITIES $_____   fill in numbers

    F. POWER & FUEL $_____

    G. MARKETING COSTS $_____

    H. BREEDING COSTS $_____

    I. DIRTI $_____
       (Depreciation, Interest, Repairs, Taxes and
       Insurance)

    J. INTEREST ON OPERATING CAPITAL $_____

    K. FAMILY LIVING DRAW $_____

                       TOTAL   (B)$_____

3. MAXIMUM DOLLARS FOR DEBT SERVICE PER COW   (C)$_____

4. MAXIMUM TOTAL DEBT SERVICE AS PERCENT OF
   GROSS INCOME   (C/A x 100) _____%

5. INTEREST RATE FOR COW LOAN   _____%

6. LOAN PERIOD FOR COW LOAN   _____YRS

7. CALCULATING AMORTIZING FACTOR:

    $A = $ INTEREST RATE/100   _____/100 = _____

    $B = (1 + A) \blacktriangleleft$ (Loan Period)   (_____) $\blacktriangleleft$ (____) = _____

    $CCC = (1/B)$ (1/_____) = _____

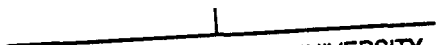 $CC = (1 - CCC)$ (1-_____) = _____

    $C = (CC/A)$ (_____/_____) = _____

    $AMF = 1/C$ (1/_____) = _____

8. MAXIMUM LOAN = (CASH AVAILABLE/AMF) = (_____/_____) = $_____

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