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## Managing for Today's Cattle Market and Beyond

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# *Determining Your Economic Unit Cost of Producing A Hundred Weight of Calf*

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### **Introduction**

Beef cow producers have traditionally focused their beef cow management attention on the physical production traits of their herds. Weaning weights have typically been the primary focus of many beef cow producers. Economic analyses have confirmed that high production is important but does not guarantee high profits.

Astute beef cow producers are starting to recognize that more than just weaning weights are determining beef cows profits. In today's economic environment, managers of high-profit herds are also focusing considerable management attention on the economic traits of their beef cow businesses. High production levels, when coupled with low unit costs of production, are sure recipe for running a high-profit beef cowherd.

### **The Profit Equation**

Profit in the beef cowherd is determined by a basic profit equation composed of three critical components. These three critical components are hundredweights (Cwts) of calf produced, price received for calves sold (Price), and the unit cost of producing a hundred weight of calf (UCOP). The basic profit equation is:

$$\text{Profit} = \text{Cwts (Price - UCOP)}$$

The first profit component (Cwts) is production oriented and the other two components are economics oriented.

Unit cost of producing a hundredweight of calf (UCOP) plays a major role in determining overall profits from the beef cowherd. This fact sheet focuses on UCOP by laying out a step-by-step procedure a beef cow producer can follow. Beef cow producers are encouraged to follow these steps in calculating his herd's unit cost of producing a hundredweight of calf.

### **Unit Costs of Production**

Statistical analysis of North Dakota's 1994 Integrated Resource Management (IRM) Cooperator herds suggests that only 20 percent of the herd-to-herd variation in profits can be explained by weaning weights.<sup>1</sup> This, in turn, suggests that 80 percent of the herd to herd variation in profits has to be attributed to something other than weaning weights. This 1994 statistical analysis also suggested that cost of production goes a long way towards explaining the remaining 80 percent of the herd-to-herd variation in profits.

Further analysis suggests that unit cost of producing a hundredweight of calf, rather than costs of production per cow, plays a major role in determining beef cow profits. As we go through the

next cattle cycle, beef farmers and ranchers need to expand their management attention beyond weaning weights to also include their herd's unit cost of producing a hundred weight of calf.

Why do we favor unit cost of production over cost of production per cow? Cost per cow has very little management power because it does not reflect the herd's productivity. Unit cost of producing hundredweight of calf, on-the-other-hand is a ratio of the herd's total costs of production in the numerator and the herd's total pounds of calf produced in the denominator. It takes both costs and production into account.

UCOP is an index of total costs divided by total units of production. Both production efficiency and economic efficiency are measured simultaneously by UCOP. Unit cost of production (UCOP) gets its analytical power from the fact that all production costs and all units of physical production are taken into account simultaneously.

Beef farmers and ranchers are encouraged to take advantage of today's high cattle prices by building a financial reserve. The first step in building a financial reserve during the current "up market" is for beef farmers and ranchers to calculate their herd's UCOP. The second step is to compare the herd's UCOP to a set of benchmark herds' average UCOP to find out if the herd is a low cost or high cost herd.

A high-cost producer's third step for building a financial reserve is to lower UCOP. Increasing the herd's production efficiency and/or economic efficiency can do this. On-the-other-hand, the third step for a low-cost producer is to ensure that he remains a low-cost producer even during times of high prices. A rancher's economic survival during the next down-turn in the cattle prices may well depend on his being a low-cost producer during today's good times and on his building a financial reserve to take him through the next cattle cycle's tough times.

### ***Divide Your Business Into Profit Centers***

Rather than treating a farm or ranch business as one total business, it is recommended that a beef farmer or rancher divide his total farm or ranch business into profit centers and then treat each profit center as a stand-alone business. The key to enhancing overall business profits is to make each profit center stand on its own with its own profit or

loss statement. Then, expand the profitable profit centers and reduce or get rid of the loss generating profit centers generating.

A typical beef farm or ranch can be divided into a beef cow profit center, a backgrounding profit center, a forage profit center, a pasture profit center and a cash grain profit center. The beef cow profit center goes from conception to weaning. The backgrounding profit center goes from weaning until sold as feeders or transferred to a retained ownership profit center. The beef cow profit center and backgrounding profit center are two different profit centers even though most beef farmers or ranchers treat both as one profit center.

The market value of the weaned calves is credited to the beef cowherd and entered as a cost to the backgrounding profit center. The key question that we want every beef farmer or rancher to answer is "Did I make my profit pre-weaning or post weaning?" It is absolutely critical that you know the answer to this question. Pre-weaning profit is generated from the beef cows and the post-weaning profit is generated from the backgrounding and/or retained ownership.

Pasture is also treated as a stand-alone profit center. Pasture grazing should be priced to the beef cow profit center at the going local pasture rental rate; then, the pasture profit center should be credited with the same local pasture rent as income. By comparing your pasture income to your pasture costs, you will know if you are making any profit operating the pasture profit center.

Home grown forages fed to the beef cows should be priced into the beef cow profit center at the going market price (opportunity costs) and then credit your forage profit center with the market value of the forage fed. Now you can determine if you are making any profit raising forages.<sup>2</sup>

Once you have several years of profit or loss statements for each profit center, you will have a good feel for the enterprise changes that will increase overall profits and for the enterprise changes that will reduce losses in your beef farm or ranch business.

### ***Calculating the Beef Herd's Costs of Production***

The worksheet at the end of this fact sheet was designed to assist beef cow producers in analyzing the beef cow profit center. The objective of this fact

sheet is to assist beef cow producers in determining their unit costs of producing a hundredweight of calf.

In order to keep the data input to a minimum, a worksheet has been designed just for the beef cow profit center. Producers are encouraged to complete this worksheet using their last year's production and economics figures. The following discussion corresponds directly with each section on the accompanying worksheet.

In no way is this simplified manual worksheet designed to be replacement for the more comprehensive IRM-SPA<sup>3</sup> or IRM-FARMS<sup>4</sup> computerized analyses. It is hoped that this simplified worksheet will motivate producers to utilize the more in-depth computerized analyses available from IRM-SPA and IRM-FARMS.

### ***Section 1: Production Profile***

The National Integrated Resource Management Standardized Performance Analysis (IRM- SPA) Guideline suggests that reproductive performance of a beef cow herd needs to be based on females exposed to the bulls. The percent calf crop (Item I, Section 1) is based on the females exposed (Item C, Section 1).<sup>5</sup> The IRM-SPA Guideline for calculating females exposed allows producers to subtract out those females that were tagged as culls before bull turnout. In addition, producers are to add in any bred females purchased or subtract out any bred/exposed females sold.

Producers should not subtract out cows that died, cows culled because of poor performance or cows culled because they are open. Producers also should not subtract out cows culled because of lightweight calves. This final number is referred to as *SPA Adjusted Females Exposed* that is a primary number used in calculating reproductive performance of a beef cowherd.

### ***Section 2: Gross Income***

A beef cow profit center generates both cash and non-cash income, both of which have to be taken into account when preparing an economic analysis of the beef cow profit center. The cash income is most readily identifiable as it related to the cash generated at sale time. Calf sales, Items 1 & 2, Section 2, reflect the cash income generated from calf sales. If you did not actually sell the calves, value the steers and all heifers not held back for breeding as if they had actually been sold at weaning. The beef cow profit center goes from

conception through weaning. Backgrounding and/or retained ownership are different profit centers.

Economic value of the cull cows is the capital gains. A capital gain is the difference between the book value (purchase price minus depreciation taken to date) and the selling value of the cull cow.<sup>6</sup> Capital gains can be positive or negative.

Cull bulls are also accounted for through capital gains and not cash income. The capital gains of all bulls sold are the difference between the book value (purchase price minus depreciation taken to date) and the cash value when sol. Again, capital gains can be positive or negative.

The final component of the beef cow profit center's accrual adjusted income is inventory change. You must first calculate a beginning inventory value for the beef cow herd along with an ending inventory. Inventory change is calculated by subtracting beginning inventory from the ending inventory. Remember that inventory change can be positive or negative.

Adding up the six components of income generates the accrual-adjusted income for the beef cow profit center.

Since a beef cow profit center generates joint products -- steer calves, heifer calves, cull cows, cull open heifers, cull bulls and inventory change -- calculating costs per hundred weight of calves produced is difficult, at best. The authors' recommended procedure for handling this "joint product" problem is to convert all income from the six different products into the equivalent hundred weights of income from steer calves (Item 9, Section 2)<sup>7</sup> here after referred to as hundredweights of steer equivalents.

Taking the combined gross income from all six products (Item 8, Section 2) and dividing it by the price of steer calves (found in line 1, Section 2) calculates the hundredweight of steer equivalents. For example, if the total income is \$500 per cow and the price of steer calves is \$98, then this \$500 income is equivalent to the income from 5.10 hundred weights of steer calves. Unit cost of production (UCOP) is then calculated with the 5.10 hundredweights of steer equivalents. This UCOP can be compared directly to the market price of steer calves.

### ***Section 3: Feed Cost***

The National IRM-SPA Guideline published by NCBA suggests that an economic analysis of a

beef cow profit center should value farm raised feeds fed at fair market value (opportunity costs). This suggests that if your neighbor would have paid \$50 a ton for the hay fed to your cows, than your own cows should also pay \$50 for that hay.

Pasture land is to be charged to your beef cows at the going rental rates. This means that both deeded pasture land and rented pasture land should be charged in at rental rates. Public land should be priced in at actual cash cost. Aftermath grazing costs, if any, should also be included and is typically expressed on cost per cow-day basis.

Total feed costs per hundred weight of calf sold is calculated by taking the total feed costs per cow (Item 16a) and dividing by the hundredweights of steer equivalents (Item 9).

#### **Section 4: Livestock Costs**

The only expenses that should be charged to the beef cow profit center are those expenses directly associated with the operation of the beef cow profit center (e.g., feeding, checking pastures, pumping water, veterinarian, etc.). It must be remembered, however, *that when farm raised feeds are priced to the beef cows at fair market value, farming machinery, equipment and production expenses for farm raised feeds (e.g., fuel, repairs, maintenance) can not also be charged to the beef profit center.* It is very easy to double account.

The cost of growing and breeding replacement heifers covers from weaning a heifer calf until a pregnancy-checked heifer is transferred into the main cowherd. The market value of the weaned heifer calf is not directly included in this analysis because heifer calves held back for replacements also were not valued in the gross income (Section 2).<sup>8</sup> Heifer growing-costs are prorated out to all cows in the herd by taking the heifers' growing-cost times the replacement rate of the herd. If it costs \$300 to grow the replacement heifer and your replacement rate is 15 percent, this procedure prorates out a heifer replacement cost of \$45 per cow ( $0.15 \times \$300$ ).

Interest on borrowed capital should cover interest paid on the breeding herd debt, building debt used by beef cows, and equipment debt used by the beef cows. Interest should not include farmland debt or farming machinery debt. Pasture land debt interest is separated out and put on its own line in Section 4 to emphasize that, *if pasture is charged at the going rental rate, then pasture debt interest is also not part*

*of the economic costs of the beef cow herd (see Item 25).*

The bottom of the Livestock Costs section (Section 4) is used to present a *direct cost summary* of feed costs plus livestock costs.<sup>9</sup>

#### **Section 5: Overhead Costs**

Overhead costs are those asset costs directly associated with the breeding herd. A common error that beef farmers and ranchers tend to commit, when dealing with the profit center concept, is that they want to charge all of their farming overhead costs (including machinery investment) to the beef cow profit center. Charging farming costs to the beef cow profit center leads to double accounting when farm raised feeds are also charged in at fair market value.

In order to keep the calculation of overhead costs as simple as possible, overhead costs are estimated with some general farm management thumb rules. Thumb rules for depreciation, insurance, repairs, taxes, and interest (the *DIRTI-Five*) are presented in Table 1. The *DIRTI* factor for buildings is figured by setting depreciation at 5%, insurance at 1%, repairs at 1%, property Taxes at 0% (North Dakota does not have a property tax) and Interest at 0%. Interest in the generalized *DIRTI-Five* is set to one-half of the going interest rate to adjust for the fact that market value of assets depreciate.<sup>10</sup> Interest is set to zero in this specific analysis because return on equity capital is part of the residual claimant in the bottom line of this economic analysis. The *DIRTI-five* for buildings (excluding Interest) in North Dakota totals 7%. Due to property taxes, your state's *DIRTI-Five* for buildings could be higher.

The *DIRTI-Five* for equipment in North Dakota is depreciation at 10%, insurance at 1%, repairs at 2%, taxes at 0%, and interest at 0% for a total of 13% (plus your property tax percentage in your state). Overhead costs on the breeding cows cover a 1% insurance charge on the investment value of the breeding herd. Your *DIRTI-Five* numbers maybe slightly different if your state has a property tax on building and/or equipment.

A common profit center error that beef farmers and ranchers tend to commit is to charge all of their farming machinery overhead costs to the beef cow profit center. Charging machinery overhead to the beef cow profit center leads to double accounting

**Table 1. DIRTI Factors For Capital Asset Costs (North Dakota)**

	<u>Buildings</u>		<u>Equipment</u>		<u>Cows</u>	
	<u>Ours</u>	<u>Yours</u>	<u>Ours</u>	<u>Yours</u>	<u>Ours</u>	<u>Yours</u>
Depreciation.....	5%	_____	10%	_____	--	_____
Interest.....	5.5%	_____	5%	_____	10%	_____
Repairs .....	1%	_____	2%	_____	--	_____
Taxes <sup>a b</sup> .....	____%	_____	____%	_____	____%	_____
Insurance .....	1%	_____	1%	_____	1%	_____
DIRTI Factor	12%	____%	18%	____%	11%	____%
Excluding Interest	7%	____%	13%	____%	1%	____%

<sup>a</sup> Land taxes are changed to the crop/pasture profit centers and not to the cow herd.

<sup>b</sup> Property taxes vary from state to state so this number is left blank for users of this form to enter in their own property tax numbers.

when raised feeds are also charged to the beef cow at market value.

**Section 6: Unit Cost Of Production Summary**

The unit cost of production summary presents the income and costs summarized on a per cow and on a per hundredweight of calf produced (steer equivalent) basis. *Earned returns per cow* are used to measure the beef farm or ranch family's earned returns to unpaid family and operator and labor, management, and equity capital. The per hundred weight column presents the *unit cost of producing* a hundred weight of steer calves. Unit cost of production becomes your breakeven cost of producing a hundred weight of steer calves. By using the "steer equivalent" procedure for calculating UCOP, Your UCOP can be directly compared to the market price of steer calves.

**Are You A Low Cost or High Cost Producer?**

You are now able to compare your unit cost of producing a hundred weight of steer calf with the average unit cost of production on a set of benchmark herds. The three benchmark herd averages presented in Table 2 are for the 1999 calf crop produced by North Dakota's Integrated Resource Management (IRM) Cooperators. These IRM Cooperators came primarily from North Dakota but a few herds came from Minnesota and Eastern Montana. These Northern Plains Benchmark Herds were used to construct the UCOP barometer presented in Table 2.

The Benchmark Herds were divided into three groups based on unit costs of producing a hundred weight of calf. The average costs come from the average of all of the 1999 Northern Plains Benchmark herds. The low cost number presents the average of the low cost 1/3 of the benchmark herds and the high cost number presents the average of the high cost 1/3 of the benchmark herds.

Keep in mind that these benchmarks are the three groups' averages. The range in the groups' average costs of production is \$56 to \$70 per cwt of calf produced <sup>11</sup>, however, the individual herds' unit costs of production was wider --ranging from a low of \$38 to a high of \$81 per hundredweight of calf produced.

**Table 2. Unit Costs Of Producing A Hundred Weight Of Calf<sup>a</sup> Based On Economic Analysis For Your Beef Cow Profit Center**

\$56.00	\$62.00	\$70.00
low costs	average costs	high costs

<sup>a</sup> The Unit costs of production range presented are the averages for the low cost 1/3, average of all herds, and the average for the high cost 1/3 North Dakota herds producing 1999 calves.

Place your unit costs of production in its appropriate place on the cost barometer in Table 2 and answer the following question:

**I am a (low, ave or high) \_\_\_\_\_ cost producer.**

**Section 1: Production Profile**

A. January 1 Number Of Beef Cows .....	= _____	Head
B. January 1 Inventory Of Replacement Heifer Calves .....	= _____	Head
C. SPA Adjusted Females Exposed To Bull Last Year .....	= _____	Head
D. Live Calves Born .....	= _____	Head
E. Live Calves Weaned .... _____ Steers, _____ Heifers _____ Bulls .....	= _____	Head
F. Number Of Cows Replaced .....	= _____	Head
G. Number Of Cows That Died .....	= _____	Head
H. Calves That Died .....	= _____	Head
I. Percent Calf Crop .....(E/C) x 100 .....	= _____	%
J. Replacement Rate .....(F/A).....	= _____	%
K. Cow Death Loss .....(G/A) .....	= _____	%
L. Calf Death Loss .....(E/D) .....	= _____	%

**Section 2: Gross Income**

Herd #	Ave Wt	Amount	Units	Price	Total
1. Steer Calves ....	_____	_____	_____ Lbs	\$ _____	\$ _____
2. Heifer Calves ..	_____	_____	_____ Lbs	\$ _____	\$ _____
3. Cull Cows .....	_____	_____	_____ Lbs	\$ _____	\$ _____
4. Cull Rpl Heifers ..	_____	_____	_____ Lbs	\$ _____	\$ _____
5. Cull Bulls .....	_____	_____	_____ Lbs	\$ _____	\$ _____
6. Inventory change ...	Beginning \$ _____		Ending \$ _____	Change =	\$ _____
7. TOTAL GROSS INCOME.....				\$ _____	
8. GROSS INCOME PER COW (Item 7/ Item A).....				\$ _____	
9. TOTAL INCOME/COW IS EQUAL TO HOW MANY CWTs OF STEER INCOME? \$ _____					
9a. PRICE RECEIVED PER HUNDRED WEIGHT OF STEER CALF SOLD				\$ _____	

**Section 3: Feed Cost**

			Per Cow	Per Cwt
12. Pasture -- Going Rent .....	_____ A/Cow @	\$ _____/A	= \$ _____	
12a. Public Land Payment.....	\$ _____/Herd.../	_____ Cows	= \$ _____	
12b. After Math Grassing	\$ _____/Hd Da times	_____ Hd Da	= \$ _____	
13. Pasture Maintenance .....	\$ _____/Hd Da times	_____ A/Cow	= \$ _____	
14. Hay .....	_____ Tons@	\$ _____	= \$ _____	
15. Grain .....	_____ /Bu @	\$ _____	= \$ _____	
16. Salt & Mineral .....	_____ Lbs@	\$ _____	= \$ _____	
16A. TOTAL FEED COSTS .....			\$ _____	
16B. TOTAL FEED COSTS PER HUNDRED WEIGHT OF CALF SOLD .....				\$ _____

<b>Section 4: Livestock Costs</b>			
		<b>Per Cow</b>	<b>Per Cwt</b>
17. Vet & Medicine .....	\$ ___/Hd.....	\$ _____	
18. Breeding .....	\$ ___/Hd.....	\$ _____	
19. Marketing .....	\$ ___/Hd.....	\$ _____	
20. Growing Costs Of Rpl Heifer .....	___%/Cow @ \$ ___/Hd =	\$ _____	
21. Mach & Equip (Fuel,Rep& Maint)	\$ ___/Hd .....	\$ _____	
22. Other .....	\$ ___/Hd .....	\$ _____	
23. Interest On Operating Capital .....	\$ ___/Cow @ ___% =	\$ _____	
24. Interest On borrowed Capital (Cows, Building, & Equipment) .....		\$ _____	
25. Interest On Pasture Land Money Borrowed .....	\$ _____	\$xxxxxx	
26. TOTAL LIVESTOCK COSTS (\$/COW) .....			\$ _____
26a. RETURNS ABOVE FEED AND LIVESTOCK COSTS (\$/COW).....		\$ _____	\$ _____
26b. BREAK-EVEN PRICE PER CWT TO COVER DIRECT COSTS .....			\$ _____

<b>Section 5: Overhead Costs</b>			
		<b>Per Cow</b>	<b>Per Cwt</b>
27. Breeding Herd Investment.....	\$ ___/Herd @ 1.0 % .....	\$ _____	
28. Buildings (Beef Cows Only) .....	\$ ___/Herd @ ___% .....	\$ _____	
29. Equipment (Beef Cows Only) .....	\$ ___/Herd @ ___% .....	\$ _____	
30 . TOTAL OVERHEAD COSTS .....		\$ _____	\$ _____

<b>Section 6: Unit Cost Of Production Summary</b>			
		<b>Per Cow</b>	<b>Per Cwt</b>
31. TOTAL INCOME .....		\$ _____	\$ _____
32. TOTAL COSTS.....		\$ _____	\$ _____
33. <i>Earned Returns To Unpaid Family &amp; Operator Labor, Management &amp; Equity Capital</i> .....		\$ _____	\$ _____
34. <b>BREAK-EVEN PRICE/CWT OF CALF SOLD TO COVER ALL COSTS</b> <sup>a</sup> .....			\$ _____

<sup>a</sup> BREAK-EVEN Steer Price = (total costs/cow,[32])/Cwts of Steer Equivalent Income, [9])

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<sup>1</sup>Profit is defined as the earned net returns to unpaid family and operator labor, management, and equity capital – the three resources contributed to the cow herd by the beef farm or rancher family.

<sup>2</sup> Most of our Northern Plains IRM Cooperators can raise hay cheaper year-in and year-out than they could buy hay year-in and year-out with one exception. That exception is the beef cow producer that has money borrowed for the hay baler, the tractor that pulls the baler, and maybe even money borrowed on the hay land. For these producers, the cost of raising hay year-in and year-out is typically higher than buying their hay year-in and year-out.

<sup>3</sup> Integrated Resource Management Standardized Performance Analysis typically available through your State's Cooperative Extension Service and/or NCBA.

<sup>4</sup> Integrated Resource Management Financial And Reproductive Management System available through North Dakota State University Extension Service.

<sup>5</sup> A worksheet for calculating SPA Adjusted Females is available at [www.ag.ndsu.nodak.edu/cow/irm/spaform.pdf](http://www.ag.ndsu.nodak.edu/cow/irm/spaform.pdf). You will need Adobe Reader to access this file.

<sup>6</sup> Since raised cow are on the depreciation schedule at zero value, the capital gains of raised cull cows equals the sales barn dollars generated.

<sup>7</sup> The IRM-SPA Guideline recommends an alternative to the steer equivalent approach. It recommends that the joint products be handled by subtracting the non-calf income from total costs with the remaining costs attributed to the pounds of calf produced. The assumption here is that the non-calf income just equals the non-calf costs. This fact sheet, however was designed around the Steer Equivalent approach. One major advantage of this steer equivalent technique is that this unit cost of production can be directly compared to the market price of steer calves. This direct comparison facilitates marketing in that steer market price and UCOP are in the same units.

<sup>8</sup> The true opportunity cost of a replacement heifer is the sum of the market value of the heifer calf held back plus the cost of growing and breeding that heifer. Interest cost on the value of the initial heifer calf for two years should also be included.

<sup>9</sup> Item 26a is calculated by taking gross income per cow (Item 8) and subtracting total feed costs per cow (Item 16A) and subtracting livestock costs (Item 26). The break-even market price to cover direct

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costs (feed costs plus livestock costs), Item 26B, is calculated by summing feed costs (Item 16A) plus total livestock costs (Item 26) and dividing by the total hundredweights of steer equivalents (Item 9).

<sup>10</sup> Interest cost is frequently figured by using an average investment figure (purchase costs 0+salvage value) divided by 2 time interest rate. Instead, this was simplified by dividing interest into one-half.

<sup>11</sup>The narrowest range of any year analyzed. This is attributed to the fact that these IRM Cooperators have been analyzed their herds over several years and they are consciously lowering their unit cost of production over the years.