Determining Unit Costs of Production

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Unit Cost of Production – What is it?

Unit cost of production (UCOP) is a value based on a relationship in production or manufacturing between costs and units of product made or produced.

$$\text{Unit Cost of Production} = \frac{\text{Costs}}{\text{Units Produced}}$$

The relationship between the numerator (Costs) and the denominator (Units Produced) is what drives the UCOP value. For example, if costs increase, while units produced increase at a proportionally slower pace, stay the same or decrease, than UCOP values go up. If units produced increase while costs increase at a proportionally slower rate, stay constant or decrease, than UCOP values go down.

The power of the UCOP ratio for cow-calf producers is that everything involved in the production of a pound of calf is represented in the numerator or denominator of the equation. For example, if a producer wants to buy a pickup that will be used in the production of calves, he can estimate how the purchase of that new pickup will affect his UCOP in terms of cost per pound of calf produced. The same thing goes for the purchase of a new bull. Evaluating the purchase of a bull in light of how many estimated pounds of calf that bull will produce in relation to his cost can give insight into what a producer might be willing to spend.

Unit Cost of Production and Enterprise Analysis

The old adage "you can't effectively manage what you don't measure" is true in relation to managing the cow-calf enterprise. The first step in calculating UCOP is to have production and financial records. These records do not have to be complicated, but they need to be accurate and thorough. They also need to allow for the allocation of expenses to different enterprises within the operation, if multiple enterprises exist. Many computerized financial record keeping programs are designed to easily track and allocate expenses to enterprises.

It can be very challenging to evaluate ways to improve unit cost of production for a cow-calf enterprise without conducting an enterprise analysis. If an operation's financials basically consist of a yearend financial statement prepared for tax purposes, knowing where to make changes to improve profit can be difficult. This is especially true if the cow-calf enterprise is part of an operation made up of a number of different enterprises.

For example, let's take a central Nebraska Sandhills ranch that is operated on owned land, has a cow-calf operation, calves are retained and sold as yearlings and the ranch harvests hay.

One of the major products this ranch markets every year is yearling steers. However, this ranch also markets non-pregnant heifers, heiferettes, bred heifers, non-pregnant cows, bred cows and salvage bulls. What are the different enterprises on this operation? Which enterprises are profitable and which ones may be just breaking even or losing money? With only the information found on a yearend financial statement used to prepare a tax return, it is really difficult to know.

For the sake of this example, let's break this ranch into major enterprises or businesses.

1. Land
2. Cow-calf
3. Stocker/Yearling
4. Heifer Development
5. Hay

Frequently, the first enterprise, land, is often overlooked when evaluating the operation as a whole. This is especially true if the land is owned. The land business should be a standalone enterprise on the ranch that the other enterprises, on paper, should pay the equivalent of a fair market value lease rate for. The cow-calf, stocker/yearling, heifer development and hay business all need to pay the land business for the use of the land. All of the costs associated with the land business need to be allocated to that enterprise. Even though this "paying" of the land business only occurs on paper with records utilized within the ranch, it allows the ranch manager to accurately analyze the profitability of and returns to the land business. By treating the five major enterprises on the ranch as individual businesses and having each enterprise "pay" a fair market value rate as resources are utilized or moved between enterprises the manager can accurately see where costs as well as revenue are occurring.

One of the challenges producers and others frequently cite when discussing the separating of the ranch into enterprises is the difficulty in knowing how to break out expenses that occur. For example, the tractor that is used to pull the baler to put up hay is also used to feed hay in the cow-calf enterprise as well as the stocker/yearling and heifer development enterprises. How should expenses related to that tractor be allocated? Initially, take a best guess as to the amount of time or hours a piece of equipment is used within a respective enterprise and then break out related expenses accordingly. The goal is to get close and provide a figure that will allow for a reasonably accurate enterprise analysis. In subsequent years, simple records such as writing down the number of hours the tractor has at the start and end of the haying season can be used to refine these numbers.

Allocating Overheads

A risk a manager should be aware of when allocating expenses to enterprises is the fact that elimination of an enterprise won't always remove all the associated costs involved with that business. For example, let's say the manager of our example ranch is tired of harvesting hay and wants to determine what the ranch might look like financially if he grazed his meadows and purchased hay. Discontinuing the hay operation will not eliminate all costs that were associated with that enterprise, since the tractor used in harvesting hay is also used in the feeding of hay. The taxes, insurance, depreciation, repairs and any interest on money owed on the tractor are now going to be paid entirely by other ranch enterprises that use it. Eliminating the haying enterprise, which would reduce the hours the tractor is used, will actually raise the overall tractor expenses related to the cow-calf and stocker/yearling business, since they are now responsible for all tractor related expenses. Evaluating the ripple effects of a decision made within one enterprise across other enterprises is an important consideration when making management decisions.

Major Costs in a Cow-Calf Enterprise

There are two types of cost in a cow-calf enterprise: overhead and direct costs. Overhead costs are costs that don't change very much in relation to the number of cows that are in the herd. For example, if you have 300 cows and buy your neighbor's 100 cows and lease their land, you are probably not going to go hire another person to help you, buy another pickup, horse and livestock trailer to care for those 100 cows. Overhead costs are reduced per cow as numbers grow, until the business reaches some level where a decision needs to be made to add additional labor and equipment. Direct costs are those costs that increase incrementally with each cow that is in production. Supplement, vaccine, salt and mineral, tags etc. are examples of direct costs.

Feed

For most cow-calf enterprises, the largest expense is feed. Grazed and fed feed along with supplements typically make up 40-60% of the costs associated with cow-calf production. Effectively controlling feed costs is a critical component to keeping costs of production in check.

Cow Depreciation and/or Replacement Heifer Development

The second largest major cost for cow-calf operators and one which is often overlooked is cowherd depreciation.

$$\text{Depreciation} = \frac{\text{Purchase Price - Salvage Value}}{\text{Years of Service}}$$

Depreciation expense can be addressed by reducing replacement purchase price, increasing salvage value or by increasing the years of service. The cost of depreciation is often "hidden" in cow-calf operations because many of the costs associated with developing bred replacement heifers are not expenses the producer writes a check for. The market value of a weaned heifer calf plus all of the associated costs with getting her developed, calved, wean a calf and back into the herd as a pregnant coming three-year-old are significant. Cow-calf producers who develop their own replacement heifers should enterprise replacement heifer development as part of their operations. Heifers should be "purchased" from the cowherd at weaning at what is deemed a fair market price. From that time all costs associated with developing that heifer are tracked through the point in time that she is identified as pregnant and ready to enter the cowherd as a bred heifer. At that time the bred heifers are then "purchased" by the cowherd from the heifer development enterprise at a fair market value. Enterprising replacement heifer development can bring clarity to the true costs associated with developing bred heifers from the cowherd. They can also help producers evaluate whether they are better off raising or buying bred replacements.

Equipment, Buildings and Labor

Equipment, buildings and labor expenses can vary greatly between cow-calf operations. These overhead expenses need to be accurately tracked and accounted for. The depreciation, interest, repairs, taxes, and insurance associated with buildings and equipment for the cowherd can be a substantial expense. Managers of consistently profitable cow-calf enterprises work hard to minimize building and equipment expense.

Labor is a cost that many cow-calf producers struggle to figure as they frequently "pay" themselves from returns after all other expenses are met. If you are wondering what you should charge the cowherd for the labor you contribute, figure in the total cost of what it would cost to hire someone else to replace you. The cow-calf enterprise should be charged accurately for both hired and family member/ownership labor.

Bulls or Breeding Expense

Bulls and/or breeding expenses associated with getting heifers/cows pregnant are a significant expense for most operations. Utilizing genetics that fit a producer's production system and marketing program are important. Carefully analyze investment in this area and examine ways to capture greater returns per dollar invested.

Other Cash Costs

Other cash costs are operating expenses related to things such as veterinary supplies and care, utilities, fuel, marketing, professional development etc. Even though this category is often a smaller percentage of total annual cow costs, this area still should be scrutinized to identify ways to efficiently utilize input expenses.

Ownership or Opportunity Costs

These are "costs" such as interest on equity invested in the cowherd. Most cow-calf producers have equity in the cowherd but don't charge themselves interest for that capital investment. If someone asked you for an interest-free loan, you probably wouldn't give them one! Yet many cow-calf producers fail to consider what should be a "fair" return on the equity they have invested in their cowherd. Charge the cows what you believe to be a fair interest rate on their value. If the cow-calf enterprise can pay all expenses plus interest on equity, it is a signal that this enterprise is a profitable one, and expansion opportunities should be evaluated.

Developing a Unit Cost of Production Analysis

If you have never performed a UCOP analysis on your cow-calf enterprise or broken the ranch into different enterprises, it can initially seem overwhelming. However, like most things in life, the more you work at something, the easier it gets. If you are familiar with the use of Excel® spreadsheets, they are available for download at http://hpranchpracticum.com/. These spreadsheets use the information and formats developed by Dr. Harlan Hughes and have been put into forms that can be easily used in Excel®. At the High Plains Ranch Practicum website are sample ranches that have UCOP numbers calculated for them as well as instructional videos that help producers walk through the process. There are additional Extension personnel and programs available that can assist producers in calculating UCOP for enterprises on their ranch.

Summary

Unit Costs of Production is the one ratio that takes into account both product produced and input costs. Knowing UCOP allows a manager to look forward utilizing both present and projected input costs with production numbers to make informed decisions. Cow-calf producers who know UCOP numbers for their operation's enterprises and understand the interaction between input costs and production can implement strategies to effectively manage resources to meet business and personal goals.

On the next page, Table 1 shows the costs to produce a weaned calf from a sample central Nebraska ranch. In this example, the cowherd is static with a 16% replacement rate. The number of bred heifers entering the herd is equal to the number of cows that are culled or lost due to death loss. All costs including labor, depreciation, and opportunity cost on cowherd value is included in this example.

Table 1. Central Neb. Est. Costs/Calf Produced. Mar/April Calve & Wean Nov. 20% of Heifers Retained as Replacements. 2-Yr-Old Heifers Calving Feb. 10.			
Mature Cows Feed Costs	Quantity	Price	Cost/Cow
Crop Residue Nov 1 - Feb 28	4 Mths	$20	$80.00
Protein Supplement Jan 1 - Feb 28 alf. hay	200 lbs	$150/T	$15.00
Pasture Mar 1 - May 15 (For Calving/Pairs)	2.5 Mths	$8	$20.00
Alfalfa and Grass/Millet/Sorg. Sudan Hay	1.2 Ton	$120/T	$144.00
Pasture May 15 - Oct 31	5.5 Mths	$50	$275.00
Salt and Mineral for 12 Months	70 lbs	$.30/lb	$21.00
Total			**$555.00**
Two-Yr-Old Heifers Feed Costs 16% of the Herd			
Crop Residue Nov 1 - Feb 1	3 Mths	$20	$60.00
Protein Supplement Dec 15 - Feb 1 (alfalfa	250 lbs	$150/T	$18.75
Pasture Feb 1 - May 15 (For Calving/Pairs)	3.5 Mths	$8	$28.00
Alfalfa and Grass/Millet/Sorg. Sudan Hay	1.7 ton	$120/T	$204.00
Pasture May 15 - Oct 31	5.5 Mths	$50	$275.00
Salt and Mineral for 12 Months	70 lbs	$.30/lb	$21.00
Total			**$606.75**
Replacement Heifers 20% Replacement			
Crop Residue/Alfalfa Aftermath Nov 1 - Feb	3.5 Mths	$15	$52.50
Protein Supplement Dec 15 - Feb 15	300 lbs	$150/T	$22.50
Growing Ration Dry Lot Feb 15 - May 15	3 Mths	$45	$135.00
Pasture May 15 - Oct 31	5.5 Mths	$35	$192.50
Salt and Mineral for 12 Months	45 lbs	$.30/lb	$13.50
Total			**$416.00**
Estimated Annual Bull Feed Costs			**$600.00**
Feed Costs per Cow Unit Includes Bulls, 2-Yr-Olds & Rep. Heifers			**$670.48**
Total Other Cash Costs Vet. Med. Bldngs. Equip. Mrkting. Int. Etc.			**$120.00**
Labor	5 hours/yr	$15.00/hr	**$75.00**
Total Operating Costs			**$865.48**
Ownership Costs			
Int. on Cattle Value (Ave. Val. Over Life)	$1800	4.0%	$72.00
Purchase of bull every 4 years for 25 cows	$5000/100		$50.00
Taxes and Insurance Buildings and Equip.			$5.00
Equipment and Facilities Depreciation			$30.00
Total Ownership Costs			**$157.00**
Total Costs Excluding Cull Credits			**$1022.48**
Cull Credits			
Cull cow - death loss (0.16-0.015 = 0.145)	1250 lbs	$1.10	$199.38
Cull heifer - death loss (0.04-0.003 = 0.037)	850 lbs	$2.00	$62.90
Cull bull - death loss (0.01 - 0.0005 =.0095)	1800 lbs	$1.30	$22.23
Total Cull Credits			**$284.51**
Capital Cost of Rep. Heifer Calf at	20% Rep. Rate	$1400	**$280.00**
	Net Capital Cost		**($4.51)**
	Net Cost Per Cow		**$1017.97**
Cost/calf weaned/cow exposed at 80% = $1272.46, 85%=$1197.61, 90%=$1131.07			