A Comparison of Factors that Affect Ranching Profits[1]

LORENZ F. BREDEMEIER

Range Conservationist, U.S. Department of Agriculture, Soil Conservation Service, Fort Worth, Texas.

Highlight

To evaluate the impact of income and expense factors for beef cow–calf operations, 39 factors were identified. Using these, eight were evaluated independently for impact. A $10.00 difference in net return per cow resulted from the following changes: 57.2 pounds selling weight per calf; 3.6 cents per pound of calf weight sold; 10.3 percent calf crop; $4.02 per ton for hay; 12.2 months of pasture versus hay with hay at $14.00 per ton or 4.1 months with hay at $18.00 per ton; .2 animal unit months per acre in stocking rate; $25.30 per acre grazing land value; and $9.04 tax per animal unit. The input required to produce these changes and others related thereto must be assessed for each individual case before making resource use decisions for increasing income.

Range conservation and profits for the rancher are compatable objectives. Among the more frequent ways suggested for ranchers to increase profits are: heavier weaning weights, higher percentage calf crop, shorter feeding and supplementing periods, more productive forage, better quality forage, and timely selling for highest price.

Many studies using budgets have been made to help find the most profitable combinations of resources and enterprises. Hottel and Arnold (1965) presented budgets for alternative conditions in Arkansas. Oliver and Kline (1965) developed budgets for optimum enterprise combinations for beef cow–calf farms in southwestern Virginia. Olson (1959) used linear programming to select the best combinations of enterprises in eastern Ohio.

There is a continuing need to find new ways for landowners and operators to use economic data for increasing profits in harmony with good range conservation management. An approach for evaluating the impact of economic factors on the profits of a cow–calf operation is presented. The objective is to evaluate the relative impact of several factors on profits.

[1] Adapted from paper presented at the annual meeting of the American Society of Range Management held in Calgary, Alberta, Canada, February 11–13, 1969. Received April 5, 1969; accepted for publication December 8, 1969.

Procedure

Thirty-nine factors that influence returns to labor and management of a beef cow–calf operation were identified (Table 1). Values for each ranged from low to high based on data from ranchers' experience, publications in literature cited, and knowledgeable judgment. This range was divided into five equal units, "low," "medium low," "medium," "medium high," and "high." Any value may represent a rancher's three to five year average.

Table 1 is arranged into eight groups as used to figure: (1) herd organization, (2) gross income, (3) livestock investment and interest, (4) miscellaneous livestock expense, (5) pasture charge, (6) hay cost, (7) protein supplement cost, and (8) shelter and building charge.

A herd organization model was developed for a 150-cow herd using the "medium" values in Table 1. Forage and feed needs were determined using an adaptation of the summary table (Rasmussen, 1958). The "medium" values of all factors were used to figure income and expense to the nearest dollar for a 150-cow herd (Table 2). The minus return to labor and management is disturbing, but it emphasizes realities. There are, however, plus values such as interest return to land and building investments, and land value appreciation. There may be other long term benefits as effect on water supply, value of land for recreation, and conservation of resources for future generations as pointed out by Ciriacy-Wantrup and Schultz (1957).

The minus return provokes speculation as to changes that could produce a profit. However, the focal point of this project is which factor has greatest influence on net returns. Eight factors were selected for this analysis. They are calf selling weights, calf selling price, percent calf crop, hay cost per ton, months grazing versus months haying, stocking rate (forage production), value of grazed land, and livestock property tax. All except livestock property tax are directly related to resource use. They are considered to have major influence on net income depending on the cost of achieving the changes. Net return was calculated at all five values with "medium" value used for all other factors. Thus the effect of the single factor on net return was projected.

Results

Net returns for a 150-cow herd from different calf sale weights and prices range from a minus $6,141 to a plus of $684 (Table 3). A plus return to labor and management resulted from 450 pound calves at 30 cents with all other income and expense factors at "medium" value. To determine the influence of a factor, differences in net income resulting from changes for a factor were determined using Table 3. Analysis of weight influence revealed that 25 pound changes in calf weight at 20 cents per pound resulted in $525 difference in net income. The difference averaged $656.50 at 25 cents and $787.50 at 30 cents. When the influence of price was considered, 2.5 cents per pound produced an average difference of $918.75 for 350 pound calves. It averaged $1,050 for 400 pound calves and $1,181.25 for 450

Table 1. Management factors that influence net income of beef cow–calf ranches and values for each.

	Factor	Unit	Value: Low	Med-low	Medium	Med-high	High
1.	Cows	No.	50	100	150	200	250
2.	Cows/bull	No.	20	30	40	50	60
3.	Death loss—cows	%	1	1.5	2	2.5	3
4.	Replacement ratio	%	5	10	15	20	25
5.	Calf crop	%	75	80	85	90	95
6.	Sell weight cull cows	lb	800	900	1000	1100	1200
7.	Sell weight cull bulls	lb	1100	1200	1300	1400	1500
8.	Sell weight calves	lb	350	375	400	425	450
9.	Sell price cows	¢	12	14	16	18	20
10.	Sell price bulls	¢	12	14	16	18	20
11.	Sell price calves	¢	20	22.5	25	27.5	30
12.	Investment/cow	$	150	175	200	225	250
13.	Investment/bull	$	300	400	500	600	700
14.	Investment/repl. heifer	$	100	125	150	175	200
15.	Investment/repl. calf	$	80	90	100	110	120
16.	Interest rate on investment	%	5	5.5	6	6.5	7
17.	Ins.—livestock/$100	¢	36	38	40	42	44
18.	Taxes/AU year	$	1	1.5	2	2.5	3
19.	Vet. & Med./AU year	$	1	1.5	2	2.5	3
20.	Salt & Min./AU year	$	.25	.50	.75	1.00	1.25
21.	Selling cost/head	$	.50	1.50	2.50	3.50	4.50
22.	Livestock Equipment Inv.	$	1000	1250	1500	1750	2000
23.	Amort. Equipment Cost	$	136	170	204	238	272
24.	Months pasture	No.	4	5	6	7	8
25.	Land value/acre	$	25	50	75	100	125
26.	Stocking rate	AUM/A	.5	.75	1.0	1.25	1.5
27.	Land tax/acre	$	.25	.50	.75	1.00	1.25
28.	Fence cost/acre	$	.15	.30	.45	.60	.75
29.	Water cost/acre	$	.05	.10	.15	.20	.25
30.	Months hay feeding	No.	4	5	6	7	8
31.	Hay Fed/AU day	lb	20	22.5	25	27.5	30
32.	Hay cost/ton	$	10	12	14	16	18
33.	Months protein fed	No.	2	3	4	5	6
34.	Protein fed/AU day	lb	.5	.75	1.00	1.25	1.5
35.	Protein price/ton	$	70	75	80	85	90
36.	Lvstk. building value	$	6000	8000	10000	12000	14000
37.	Amortized building cost	$	436	581	726	871	1016
38.	Building insurance/$100	¢	45	50	55	60	65
39.	Building maintenance @ 2%	$	120	160	200	240	280

pounds. This illustrates the interrelated effect of two variables.

The same kinds of calculations were made and tables developed for land values and stocking rates, percent calf crop and selling price, and for grazing versus haying and hay price. Net return and difference also were calculated for different personal property tax rates on livestock. This is a minor factor for influencing income as evidenced by the magnitude of change needed.

When the differences in net income were plotted the result was essentially a straight line for sale weight, sale price, cost of hay, percent calf crop, and land values. The month's grazing versus haying line was almost straight. It was governed by small differences in the monthly needs for animal unit months. Differences in net return due to changes in stocking rate produced a curved line. Differences were greater at lower stocking rates than at higher. This is because uniform stocking rate increment represents a higher percentage change at lower rates.

A common base is essential to compare the impact of different factors. Ten dollars per brood cow was chosen as a meaningful unit for comparison because this difference in income per brood cow in a herd seems significant. The differences resulting *if* the value of only one factor changed and all others remained at the "medium" value were used in calculating the comparison. The results are expressed as the amount of change in value of a factor needed to produce a $10 difference in net return per cow. They are 57.2 pounds selling weight per calf; 3.6 cents per pound calf weight sold; 10.3 percent calf crop; $4.02 per ton for hay; 12.2 months of pasture versus hay change with hay at $14.00 per ton, or 4.1 month's change with hay at $18.00 per ton; .2 AUM's per acre in stocking rate; $25.30 per acre grazing land value; and $9.04 tax per animal unit.

These figures will not be the same in all situations for the factors shown. The number of month's change necessary with hay at $14 and $18 per ton illustrates this.

Most ranchers in northern latitudes of the United States find that net returns are increased markedly by longer grazing seasons and shorter hay feeding periods. Results indicate that the basis for the

Table 2. Net return calculations for a beef cow–calf ranch with 150 cows.

Herd information		
Cows kept to calve	150	
Replacement heifers @ 15%	22.5	
Replacement calves @ 15%	22.5	
Bulls @ 1 to 40 cows	3.75	
Total calves @ 85%	127.5	
Less replacement heifer calves	22.5	
Income		
Calves for sale	105	
Beef for sale (No. calves × 400 lbs.)	42,000 lbs.	
Income from calves @ .25		$10,500
Cows for sale after 2% death loss	19.5	
Beef for sale (No. cows × 1000 lbs.)	19,500 lbs.	
Income from cows @ .16		$ 3,120
Bulls for sale ⅓ per year	1.25	
Beef for sale (No. bulls × 1300 lbs.)	1,625 lbs.	
Income from bulls @ .16		$ 260
Total income		$13,880
Expense		
Investment		
Cows. Average No. for year × $200	$27,800	
Bulls. Average No. for year × $500	1,875	
Replacement heifers. Avg. No. for year × $150	3,375	
Heifer calves. Avg. No. for year × $100	750	
Total investment	$33,800	
Interest on livestock investment @ 6%		$ 2,028
Miscellaneous livestock costs		
Ins. livestock investment × $ .40/100	$ 135	
Taxes. Avg. No. AU for year × $2	332	
Vet & medical. Avg. No. for year × $2	332	
Salt & mineral. Avg. No. for year × $ .75	124	
Selling cost. No. head sold × $2.50	314	
Bull replacement. No. × $500	625	
Equipment cost. Amort. from table	204	
Total miscellaneous livestock costs		$ 2,066
Grazing cost		
Land charge. AUM's needed × $4.50	$ 4,445	
Land tax. Acres needed × $ .75	741	
Fence cost amort. Acres needed × $. .45	445	
Water cost amort. Acres needed × $ .15	148	
Total grazing cost		$ 5,779
Hay cost .375T × 994.5 AUM × $14/T		$ 5,221
Protein supplement cost 4 months × 165.75 Avg. AU's × $1.20		$ 796
Building costs		
Building cost Amort. from table	$ 726	
Building Ins. value × $ .55/100	55	
Building maintenance from table	200	
Total building costs		$ 981
Total expense		$16,871
Net return		$–2,991

$4.50 used as a cost per animal unit month for grazing is relatively high when compared to the low cost of $14 per ton for hay fed at 25 pounds per animal unit day.

This illustrates how low cost hay or other winter feed can help enhance profits. Such low costs are essential for ranchers in regions with long winter feeding periods. When hay was figured at $12 per ton and grazing at $4.50 per animal unit month, net income to labor and management was not affected by changing length of grazing and feeding periods.

This held true under the conditions used in this analysis when cost per ton is 2⅔ times the cost of an animal unit month of grazing. If hay is charged to the livestock enterprise at more than 2.66 times the animal unit month of grazing, the net return to labor and management can be increased by lengthening the grazing season within climatic limitations.

Management changes such as calving dates can influence income as demonstrated by Mueller and Harris (1967). Such changes influence income as their effect is reflected in the values of factors. Proper grazing use as contrasted with overuse can increase weights, percent calf crop, and may reduce livestock investment costs based on Soil Conservation Service experience in working with ranchers. The costs involved in producing the changes in factor values was not included in this analysis. Such costs must be considered in the application of cost and return analysis to resource uses. Individual ranchers must use their values for all factors when applying this procedure to analyzing their problems.

This entire procedure for calculating cost and returns under alternatives of factors showing return to labor and management for beef cow–calf operations has been programmed on a Soil Conservation Service computer.

Adaptations can be made for rapid computation of a rancher's data to guide his resource use decisions.

Table 3. Net returns and differences (dollars) from different calf sale weights (pound) and selling prices (dollars) based on a 150-cow herd.

Selling price	Calf sale weights 350	375	400	425	450	Average dollars/ 25 lbs.
.20	–6141	–5616	–5091	–4566	–4041	525[a]
.225	–5222	–4631	–4041	–3450	–2860	590.5[a]
.25	–4304	–3647	–2991	–2335	–1679	656.5[a]
.275	–3385	–2663	–1941	–1219	– 497	722[a]
.30	–2466	–1679	– 891	– 104	+ 684	787.5[a]
Average dollars at .025 per pound	918.75[b]	984.25[b]	1050[b]	1115.5[b]	1181.25[b]	

[a] Difference in net income due to 25 pounds change in calf sale weight.
[b] Difference in net income due to 2.5¢ per pound change in calf sale price.

Literature Cited

Beaty, E. R., J. D. Powell, J. C. Fortson, and F. B. Saunders. 1963. Production aspects of a beef cow–calf operation on grass pastures. J. Range Manage. 16:250–253.

Ciriacy-Wantrup, S. V., and A. M. Schultz. 1957. Problems involving conservation in range economics research. J. Range Manage. 10:12–16.

Doane's Agriculture Report. 1968. Do you know what it costs to keep a cow? Sep. 8, pp. 20–25.

Gerlow, A. R., and J. R. Campbell. 1965. Enterprise costs and returns for beef cattle, Southern Louisiana rice area. La. Agr. Exp. Sta. DAE, Res. Rep. No. 337.

High, T. W., Jr., E. J. Chapman, B. L. Whittenberg, and J. W. High, Jr. 1965. Fescue pastures, under different management systems, and orchardgrass-clover for yearlong slaughter steer production. Tenn. Agr. Exp. Sta. Bul. 385.

Hottell, J. B., and A. F. Arnold. 1965. Crop pasture, timber and livestock enterprises for the Boston Mountain and Ozark Highland areas of Arkansas. Ark. Exp. Sta. Rpt. Series 135, pp. 13–66.

Kearl, W. A. 1961. Cattle ranching in the Northern Plains area of Wyoming. Wyo. Agr. Exp. Sta. Mimeo Cir. No. 155.

Launchbaugh, J. L. 1957. The effect of stocking rate on cattle gains and on native shortgrass vegetation in west-central Kansas. Ft. Hays Branch Kan. Agr. Exp. Sta. Bul. 394.

Leithead, H. L. 1960. Grass management pays big dividends. J. Range Manage. 13:206–210.

Mueller, R. G., and G. A. Harris. 1967. Economics of selected alternative calving dates. J. Range Manage. 20:67–69.

Oliver, J. D., and R. G. Kline. 1965. Optimum enterprise combinations for beef cow and calf farms in southwest Virginia. Vir. Agr. Exp. Sta. Tech. Bul. 180.

Olson, R. O. 1959. Some opportunities for improving farm income in southeastern Ohio. Ohio Agr. Exp. Sta. Res. Bul. 832.

Rasmussen, L. H. 1958. Balancing livestock numbers, feed and forage on ranching units. J. Range Manage. 11:194–197.

Rieck, R. E., G. C. Pulver, and W. Henquinet. 1966. Beef cow costs and returns in northern Wisconsin. Wis. Agr. Exp. Sta. Res. Rep. 22.

Wells, A. R., and S. A. Eugene. 1966. Costs and returns of beef cow herds. Minn. Uni. Farm Business Notes No. 489.

Western, C., and A. W. Epp. 1965. The Nebraska sandhills ranch business, 1965 summary. Nebr. Uni., Agr. Col. Agr. Econ. Dep. Memo.

Willhite, F. M., and A. R. Grable. 1966. Greater profit from livestock in the intermountain west with efficient ranch management. J. Range Manage. 19:112–118.

THESIS: UNIVERSITY OF WYOMING

Diet Preference and Utilization Patterns of Elk in the Northern Big Horn Mountains, Wyoming, by George E. Probasco. M.S. Range Management, 1968.

Data were collected during the summer of 1967, on dietary preferences and grazing patterns of elk in the northern Big Horn Mountains of Wyoming. Forest openings, where only elk grazing occurred, were studied to determine preferred plant species for both the spring and summer seasons.

One forest opening of approximately 300 acres was stratified to determine if there was a correlation between elk grazing patterns and distance from forest margin. Elk grazing patterns were found to be not correlated with distance from forest margin. However, there was a definite correlation between elk grazing patterns and percent total basal cover of herbaceous vegetation.

Data on diet preferences indicated that elk utilized grasses during the spring period but shifted their preference to forbs during the summer season. Preferred species for the spring period were *Bromus marginatus*, *Bromus* spp., *Festuca idahoensis*, and *Poa* spp. Preferred species for the summer period were *Agoseris glauca*, *Balsamorrhiza incana*, *Potentilla diversifolia*, and *Astragalus miser*.