

A Case Study of the Cow Size and Production Efficiency Relationship

W.A. Whitworth¹, C.R. Stark, Jr.¹, and T.G. Montgomery²

Story in Brief

The choices made by beef cattle producers when culling cows from the herd should be based on sound economic and production data. Some producers have assumed that a larger cow will wean a heavier calf and therefore will be more profitable. This mindset has led producers to add large breed genetics to their commercial cow herds in pursuit of larger frames and the assumed increased profits. A better culling criteria than cow size is cow production efficiency (CPE). The CPE may be defined in numerous ways, but the most common measurement is pounds of weaned calf divided by cow weight at weaning. From this ratio, the more critical measure of dollars of weaned calf per dollar of cow maintenance expense can be determined. To calculate these measurements, producers must connect market prices of calves and cows with the calf weaning weights, cow weights at the time of calf weaning, and maintenance costs for the herd. A case study conducted on the Southeast Research and Extension Center cow herd at Monticello, Arkansas indicated that larger cows have the lowest CPE ratios. Economic analysis of these production results revealed that feeding cost differences between high and low efficiency cows could be more than \$50 per cow. Calf revenue difference per cow across the cow efficiency groups was found to exceed \$75.

Introduction

When making culling decisions on the cow herd, a producer should first identify what herd production goals are desirable. Two keys of herd production are calf weaning weights and cow production efficiency. Commercial producers are in the business of producing pounds of calf to sell and get paid primarily on a dollars per pound basis. Calf weaning weights should thus be increased as long as the additional size does not create calving problems such as problems from overly large birth weights.

Cow production efficiency is simply the calf weight-to-cow weight ratio. The Arkansas Cow Herd Performance Testing Program guidelines of the University of Arkansas Cooperative Extension Service (UA-CES) state that cows should wean 50% of their body weight when their calves are 205 days of age (Barham, 2006). Conversion of actual calf weaning weights to adjusted 205-day weights is necessary to account for differences in calf ages and differences in cow ages.

The most difficult calculation for many beef producers is the dollar expense of maintaining the cow herd and the necessary replacement animals to maintain steady production. Costs per cow will vary between different producers. If actual costs of production are not available, most state extension services publish cow-calf enterprise budgets that specify direct, ownership, and total costs for a representative herd. A survey of the most recent published budgets from Arkansas, Mississippi, Oklahoma, Tennessee, and Texas found that total cost was estimated at \$354 per cow for a 1,000 pound cow (one animal unit) (Hogan et al., 2006a, 2006b; Mississippi State University, 2006; Oklahoma State University, 2006; Texas A&M University, 2006; University of Tennessee, 2006). If actual cow weights have been recorded, adjustments for cow size can be made from this estimated total cost.

Experimental Procedures

Southeast Research and Extension Center Cow Herd Analysis. Examination of the relationship between cow size, calf weaning weight, and maintenance cost per cow was made as a case study of the Southeast Research and Extension Center (SEREC) cow herd that is maintained in association with the University of Arkansas at Monticello Division of Agriculture. The study herd was composed of multiparous *Bos indicus*-influenced ($\geq 3/8$ Brahman) females 3 years of age or older who had raised at least one calf. All cows that raised and weaned a calf in the years 2000 to 2005 were included in the data set. All calves were sired by Beefmaster bulls. Herd records from 5 years were analyzed to calculate average cow weights, 205-day adjusted calf weaning weights, and cow production efficiency (CPE). The CPE values for first-calf heifers were not included in the analysis since these females are producing a calf and continuing to grow in size themselves. Herd results for the remaining females were summarized after being ranked in descending order by CPE value. The total herd for each year was then divided into high, middle, and low groups by CPE values, and averages were calculated by group and over all years for each of the data components (Table 1).

Results from the herd analysis were consistent for each production year used in this study. Among the 3 annual cow groups, as ranked in descending order by CPE ratio, the average cow weights were lowest each year for the upper third of the herd (High Group) with an average of 1,223.0 lb over all years. The low group for CPE ratio had the highest average cow weights at 1,428.1 lb over all years.

The averages for 205-day adjusted calf weaning weights were highest for the high efficiency group of cows with an average of 567.2 lb over all years. Calves from the low group of cows had the lowest 205-day adjusted calf weaning weight averaging 464.0 pounds over all years studied. These weight results run counter to common beliefs that calf weights would be highest for the largest cows.

¹ Division of Agriculture, University of Arkansas at Monticello and Southeast Research and Extension Center, Monticello

² Southeast Research and Extension Center, Monticello

A desirable goal for CPE is 0.5000 where a cow is weaning a calf that weighs 50% of the cow's weight. Using the 205-day adjusted calf weaning weight, the SEREC cow herd had an overall CPE Ratio of 0.3960 for all groups over all years. When the cows for each year were divided into high, middle, and low efficiency cohorts, the high group had a CPE ratio of 0.4648, the middle group CPE ratio averaged 0.3986, and the low group averaged 0.3276. These results indicate, as expected, that larger cows have the lowest CPE Ratios.

Economic Benefits of Culling. Producers who cull their cow herd have often removed the smaller females with the mindset that larger cows will produce heavier calves and thereby generate more pounds of beef to sell per cow. A more desirable practice for identifying economic benefits is to consider the production efficiency of the cow, maintenance costs associated directly with cow size, and calf weaning weight.

The most recent UA-CES cow-calf production budgets estimate annual direct costs of pasture fertilizer, supplemental energy feed, and salt/minerals to be \$87.01 per cow. Taking this value as our benchmark for a 1,000 pound cow (one animal unit), we can estimate the additional or reduced costs of other cow sizes. The SEREC high efficiency cow group averaged 1,223.0 pounds in weight. Given the assumption that any cow consumes 2% of their body weight, this average cow weight suggests increased maintenance costs of \$19.40 per cow above our benchmark. Less efficient cow groups had even higher cost increases of \$25.27 for the middle efficiency group and \$37.25 for the low efficiency group above the benchmark (Table 2).

The calf weaning weight-cow efficiency relationship reveals the second economic component of herd culling. Arkansas cow-calf production budgets use a 540 pound calf weaning weight to estimate expected revenue. Combining this weight with the recent Arkansas state average price of \$116.60 per hundredweight for that calf weight range, the expected revenue per weaned calf is \$629.64. Using the actual 205-day average calf weaning weights for the SEREC herd and recent Arkansas state average prices per hundredweight for specific calf weight ranges, estimates can be generated of the additional or reduced revenues for each cow efficiency group.

The average calf weaning weight of 567.2 lb for the high efficiency cow group exceeded the CES budget weight. Combining the extra weight with the appropriate market price resulted in a \$10.90 gain per calf over the benchmark revenue value. The middle and low efficiency groups had average calf weaning weights below the benchmark weight. The revenue changes relative to the benchmark were \$30.08 less for the middle efficiency group and \$64.63 less for the low efficiency group (Table 3).

Implications

What is the economic value of good cow herd culling decisions? Culling can provide economic benefits by removing cows with higher maintenance costs and lower calf weaning weights. A simple measure to identify these cows is the cow production efficiency ratio. This case study of the Southeast Research and Extension Center beef herd showed that the low efficiency cow group had \$37.25 higher direct maintenance costs per cow than the Arkansas Cooperative Extension Service cow-calf budget estimate and produced \$64.63 less revenue per cow from calf sales due to a lower average calf weaning weight. Combining these values, the total potential gain from culling low efficiency cows and replacing them with average production animals would be \$101.88 per cow.

Literature Cited

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Table 1. Production results for high, middle, and low groups as ranked by cow production efficiency (CPE) ratios.

Year	High*			Middle			Low					
	No. of cows	Cow wt	205-Day calf wt	CPE ratio	No. of cows	Cow wt	205-Day calf wt	CPE ratio	No. of cows	Cow wt	205-Day calf wt	CPE ratio
2005	23	1174.7	539.5	0.4599	24	1243.1	477.1	0.3839	24	1416.9	416.9	0.2963
2004	21	1240.2	563.9	0.4557	21	1313.4	507.4	0.3865	22	1482.0	453.0	0.3075
2003	21	1269.8	593.6	0.4688	21	1335.5	528.6	0.3957	21	1426.9	498.7	0.3502
2002	11	1218.3	562.1	0.4644	12	1299.6	526.8	0.4056	12	1418.3	448.0	0.3226
2000	14	1210.0	581.8	0.4811	15	1263.4	552.9	0.4378	15	1376.5	519.5	0.3796
Average		1223.0	567.2	0.4648		1290.4	514.2	0.3986		1428.1	464.0	0.3276

*High indicates upper one third of herd, middle the mid-range of the herd and low indicates the lower one third of cow herd based on CPE ratio.

Table 2. Feeding cost differences per cow for high, middle, and low groups as ranked by cow production efficiency (CPE) ratios.

Cooperative Extension Service budget	Southeast Research and Extension Center		
	High*	Middle	Low
Cow weight = 1,000 lb	1,223.0	1,290.4	1,428.1
Maintenance cost = \$87.01	\$106.41	\$112.28	\$124.26
Change over/under CES budgeted value	+\$19.40	+\$25.27	+\$37.25

*High indicates upper one third of herd, middle the mid-range of the herd, and low indicates the lower one third of cow herd based on CPE ratio.

Table 3. Calf revenue differences per cow for high, middle, and low groups as ranked by cow production efficiency (CPE) ratios.

Cooperative Extension Service budget	Southeast Research and Extension Center		
	High	Middle	Low
Calf weight = 540 lb	567.2	514.2	464.0
Sales price = \$116.60/cwt	\$112.93	\$116.60	\$121.77
Revenue change from CES budgeted value = \$629.64	+\$10.90	-\$30.08	-\$64.63

*High indicates upper one third of herd, middle the mid-range of the herd, and low indicates the lower one third of cow herd based on CPE ratio.