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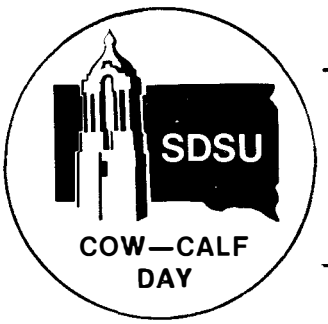

AN EVALUATION OF THE RATIO OF CALF WEIGHT TO COW WEIGHT AS AN INDICATOR OF COW EFFICIENCY

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Summary

Weaning weight of calf predicts cow efficiency more accurately than the ratio of weaning weight to metabolic cow weight and the ratio of weaning weight to cow weight. A prediction equation was developed to combine calf weight with cow weight to increase accuracy of prediction from 3 to 11% above that achieved by weaning weight alone or the ratios.

Introduction

Widespread use has been made of the ratio of calf weight to cow weight or the ratio of calf weight to metabolic cow weight (weight$^{.75}$) as an estimate of cow efficiency. The ratio gained favor because the numerator represented output while the denominator, cow weight, was taken as a measure of input, that is, the weight to be maintained throughout the year. Since the cow efficiency project at South Dakota State involves the individual feeding of cow and calf, a direct measure of cow efficiency (feed required to produce a pound of calf at weaning) is available to evaluate the accuracy of these commonly used predictors of cow efficiency.

Procedures

One hundred twenty-two records collected from 73 Angus, Charolais and Angus-Charolais crossbred cows and their calves produced from 1972 through 1974 were used in this study. All calves were sired by the same Polled Hereford bull within a year and two Polled Hereford bulls were used over the 3-year period. Progeny were allowed to nurse twice daily while cows were exposed to individual feeders. Weighed amounts of creep feed were individually available free choice at night and calves ran together in drylot during the day. Average ages at weaning for the 1972, 1973 and 1974 calf crops were 213, 185 and 204 days, respectively. Weaning efficiency was calculated as a ratio of total TDN intake of the cow and calf to weaning weight of the calf. Cow TDN was the total intake from weaning time of the previous year until weaning of the calf. Calf TDN was that amount received from creep feed only. The actual unadjusted weaning weight was used as the denominator of the efficiency ratio. Cow weight was calculated as the average of 14 weights taken over the same thirteen 28-day periods in which cow TDN intake was measured.

Results and Conclusions

The average cow weighed 1,021 pounds and weaned a calf 201 days old weighing 492 pounds (table 1). The cows varied in weight from 791 pounds

to 1,194 pounds and the calves from 335 to 663 pounds. Pounds of TDN required by cow and calf to produce a pound of weaning weight averaged 11.50 pounds and ranged from 9 to 15.8 pounds. The cow with the best efficiency weighed 946 pounds and the cow with the lowest efficiency 1,017. The ten cows with the best efficiency, all below 10 pounds TDN per pound of weaning weight, weighed an average of 982 pounds and the 11 cows above 13 pounds TDN per pound of weaning weight weighed an average of 1,017 pounds. Variation in cow condition, although present, did not have an important effect on efficiency of calf production in these data.

The results of evaluating the accuracy of predicting cow efficiency by four different methods are given in table 2. Accuracy of prediction with weaning weight alone was 81% with ratio of calf weight to metabolic cow weight 79%, ratio of calf weight to cow weight 73% and the optimum combination of calf and cow weights was 84%, where a value of 100% would indicate complete accuracy.

When only calf weaning weight records are available, cows can be ranked on the weaning weight of their calves to achieve the same accuracy as ranking them based on efficiency predicted from weaning weight. When information on cow weight is also available, cows can be ranked on the value of the following equation:

Efficiency = 17.514 - .018 (weaning wt. in lb.) + .003 (cow wt. in lb.)

This equation is useful for ranking cows on efficiency but will not be highly accurate for predicting actual TDN consumption per pound of calf produced. This is because of year to year variations and the differences between the drylot situation where these studies were conducted and pasture situations where they will be used.

Differences in feed costs per pound of calf produced for varying cow and calf weights are demonstrated in table 3. Increasing calf weaning weight lowers feed costs per pound of weaning weight at a much faster rate than decreasing cow weight. This suggests, again, that more progress in cow efficiency could be achieved through efforts at increasing weaning weight rather than decreasing cow size.

It would appear, however, that there would be limited opportunity for producers to cull cows in commercial herds on the basis of cow efficiency. Economic conditions are generally such that, if a cow is bred, it will not be profitable to cull her at weaning time and replace her with an unbred heifer. This points up the need for prediction equations that can accurately predict cow efficiency at the time heifers are usually selected, either at weaning or yearling ages.

Table 1. Means and Ranges of Drylot Cow and Calf Traits

Trait	Mean	Range
Average cow weight (lb)	1021	791 - 1194
Actual calf weaning weight (lb)	492	335 - 663
Calf age at weaning (days)	201	155 - 237
Milk production (lb)[a]	43.1	4.4 - 73.8
Efficiency (lb TDN/lb weaning wt)	11.5	9.0 - 15.8

[a] Sum of four days' measurements spaced throughout lactation.

Table 2. Accuracy of Predicting Cow Efficiency (Lb TDN/Lb Calf)

Method of prediction		Accuracy %
1	Weaning weight alone	81
2	Ratio of calf weight to metabolic cow weight	79
3	Ratio of calf weight to cow weight	73
4	Optimum combination of calf and cow weights	84

Table 3. Variations in Feed Cost Per Lb of Calf Produced With Cows and Calves of Different Weight[a] ($/Lb Calf)

		Cow wt (lb)			
		1000	1100	1200	1300
Calf wt (lb)	350	.33	.34	.34	.35
	450	.29	.29	.30	.30
	550	.24	.25	.25	.26
	650	.20	.20	.21	.22

[a] Cost of TDN from range pasture estimated at 2.4 cents per pound by Dr. Steve Waller.