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FACTORS AFFECTING WEANING WEIGHT PRODUCTION

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CATTLE 91-18

Summary

Weaning weight records from a commercial cow herd were statistically analyzed to demonstrate suspected sources of variation in weaning weight. Data from first-calf heifers and mature cows (3 to 9 year olds) were analyzed separately. For every one day increase in calf age at weaning, weaning weight was increased by 1.65 and 1.76 lb for first-calf heifers and mature cows, respectively. For every 1 percentage point increase in MPPA of the cow, weaning weight was increased by 4.5 lb. A 10% advantage in weaning weights and weight per day of age (WDA) was observed in steers over heifers. A 3 and 6% advantage in WDA and weaning weight, respectively, was observed in bulls over steers. Weaning weight and WDA peaked among cows 4 to 6 years of age and then declined. Cows that were 3, 8 and 9 years of age produced calves with similar weaning weights. Calves nursing 3-, 7- and 8-year-old cows required more treatments for sickness than calves nursing 4- to 6-year-old cows. Production records provide valuable insight into causes of variation in cow productivity.

(Key Words: Weaning Weight, MPPA, Calf Age, Cow Age.)

Introduction

Many factors, other than genetic effects, influence calf weaning weights. For example, increasing calf age at weaning is known to increase weaning weight. Therefore, increasing nutritional and management inputs in an effort to have more calves dropped early in a fixed calving season may be a prudent decision. However, there will be some point beyond which input costs will exceed extra returns.

The relationship between Most Probable Producing Ability (MPPA) of the cow and age of dam and calf weaning weight are production factors not well understood by some producers. However, both factors are important considerations for routine culling and become even more important when extra culling becomes necessary, as in drought conditions. The objective of this report is to demonstrate the effect of various factors on calf weaning weight from records obtained from a commercial cow-calf operation.

Materials and Methods

Weaning weight records for 1990 were obtained from a commercial cow-calf operation located in Bennett County, SD. Herd performance records have been processed by the South Dakota Beef Cattle Improvement Association for many years. Breeds represented in the herd include Red Angus, Simmental and Hereford. The 60-day calving season started approximately February 15 for the heifers and March 1 for the cows. Final calf weights were obtained on October 6, 1990.

The Most Probable Producing Ability (MPPA) is calculated from the cow's average weaning weight ratio, the number of calves with weaning records and the repeatability of weaning weight. MPPA for weaning weight ratio is calculated by the following formula:

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$$MPPA = H + \frac{NR}{1 + (N - 1)R}(C - H)$$

where H = 100, the herd average weaning weight ratio, N = the number of calves included in the cow's average, R = 0.4, the repeatability factor for weaning weight ratio, and C = average for weaning weight ratio for all calves the cow has produced.

The rancher kept a detailed accounting of all calves that were treated for any kind of sickness. In our data set, the number of treatments for sickness represents the number of days a calf received medical treatment.

Records for first-calf heifers and mature cows were analyzed separately as part of a deworming study. Mean, minimum and maximum values for variables associated with first-calf heifers and mature cows are shown in Tables 1 and 2, respectively. Data were analyzed by least squares procedures using the GLM procedure of SAS. For the first-calf heifers, the final model for calf performance data included deworming treatment and calf sex as independent variables and calf age as a covariate (excluding weight per day of age, WDA). For mature cows, the final model for calf performance data included deworming treatment, calf sex and age of dam as independent variables and MPPA and calf age (excluding WDA) as covariates.

TABLE 1. TRAIT VARIABLES FOR FIRST-CALF HEIFERS

Item	Mean	Minimum	Maximum
Heifer weight precalving, lb	1177	1000	1410
Condition score precalving[a]	6.3	5	8
Calf weaning weight, lb	593	430	750
Calf age at weaning, days	220	191	237
WDA, days	2.70	1.96	3.30
No. of treatments for sickness	.15	0	2

[a] Condition score 1 = very thin to 9 = very obese.

TABLE 2. TRAIT VARIABLES FOR MATURE COWS

Item	Mean	Minimum	Maximum
Age of dam, years	5.3	3	10
MPPA	101	87	116
Calf weaning weight, lb	589	390	810
Calf age at weaning, days	209	152	237
WDA, lb	2.83	1.89	3.66
No. of treatments for sickness	.25	0	4

Results and Discussion

For every one day increase in calf age at weaning, weaning weight was increased by 1.65 ($P<.001$) and 1.76 ($P<.0001$) lb for first-calf heifers and mature cows, respectively. Thus a 21-day difference in calf age at weaning would translate into about a 36-pound difference in calf weaning weight. These numbers should be interpreted as encouraging having a high percentage of cows calved in the first part of the calving season. This should not encourage moving calving date earlier and going for a longer lactation period.

One would calculate the value of this extra weaning weight as follows: Given an average weaning weight of about 590 lb and a sale price of $100 per cwt, then the rancher would get $590 per head. The calf weighing 36 lb more would weigh in at 626 lb, and if we use a $.05 per lb price discount for the heavier calf ($98.20 per cwt), then this calf would dollar out at $615.

Thus, within the price and weight range for this example, the rancher is receiving at least a $25 dollar premium for those calves born in the first part of the calving season. This does not imply that a rancher could spend up to $25 per cow on extra feed to ensure early calving. This would only be true in the unlikely event that every cow calved 21 days earlier. A more realistic expectation might be to move the average age at weaning up by 5 days by having a higher percentage of the cows calving earlier. This suggests up to $5.95 per cow for extra feed could be invested to ensure early calving ($25 ÷ 21 days = 1.19 per day; 1.19 per day x 5 days = $5.95).

The Most Probable Producing Ability (MPPA) is an estimate of a cow's future 205-day weaning weight ratio based on her past productivity. The MPPA allows for more accurate comparison of cows with different numbers of calf records in the averages. In this analysis an MPPA was calculated from all weights submitted up to 1989. Our results indicate the MPPA of an individual cow was a good predictor of weaning weight differences in 1990. In this producer's herd, for every 1 percentage point increase in MPPA of the cow, weaning weight was increased by 4.5 lb ($P<.0001$). So, in this cow herd, a cow with an MPPA of 96 would be expected to produce a calf that is 31.5 lb lighter than a cow with an MPPA of 103. For every 1 percentage point increase in MPPA, WDA was increased by .02 ($P<.001$). Thus the MPPA reliably predicts future production of the cow and makes an extremely effective culling tool.

A 10% advantage in weaning weights and WDA (All $P<.05$) was observed in steers over heifers for both first-calf heifers and mature cows. A 3 ($P<.05$) and 6% ($P<.001$) advantage in WDA and weaning weight, respectively, was observed in bulls over steers (Table 3).

Weaning weight and WDA peaked at 4 to 6 years of age and then declined (Table 3). Cows that were 3, 8 and 9 years of age produced calves with similar weaning weights. The first-calf heifers started calving about 2 weeks in advance of the mature cows and consequently their calves were 11 days older at weaning on average. For this reason we did not directly compare the weaning weight production of the first-calf heifers to mature cows. However, the weaning weights of calves nursing first-calf heifers were observed to be similar to weaning weight production from cows of ages 3, 8 and 9.

The standard deviation for weaning weight production of mature cows was 55 lb for heifer calves and 64 lb for steer calves. This indicates the range in weight from the average, which would include 68% of the calves (1 standard deviation), was 110 lb for heifer and 128 lb for steer calves.

These weaning weights demonstrate the improvement in calf crop uniformity due to calving heifers in advance of cows. Additionally, given the differences in calving ease and rebreeding potential between first-calf heifers and mature cows in this herd, there would be no production advantage to culling 8- and 9-year-old cows in favor of more heifers.

Calf age had a significant effect on the number of treatments for sickness for the first-calf heifers but not the mature cows. Among the heifers, for each day earlier in the calving season that a calf was born, sickness treatments decreased by .01 ($P<.05$). This observation may be related to a build-up of disease organisms in the calving environment of the first-calf

TABLE 3. PRODUCTION TRAITS FOR FIRST-CALF HEIFERS AND MATURE COWS[a]

	Mature cows				First-calf heifers			
Item	No.	Wean. wt	WDA, lb	Sick trt.	No.	Wean. wt	WDA, lb	Sick trt.
Calf sex								
Heifer	232	562[b]	2.68[b]	.38[g]	48	568[b]	2.58[b]	.20
Steer	240	613[c]	2.94[cg]	.50[h]	42	623[c]	2.84[c]	.11
Bull	30	648[d]	3.03[ch]	.26[g]				
SEM		8.0	.040	.097		7.2	.033	.062
Age of dam								
3	136	588[be]	2.83[beg]	.39[b]				
4	64	613[c]	2.95[ci]	.10[c]				
5	93	614[c]	2.92[c]	.11[c]				
6	65	619[cg]	2.92[f]	.00[ceg]				
7	60	612[f]	2.90[h]	.29[bcfh]				
8	49	600[h]	2.86[j]	.25[bcg]				
9	34	600[h]	2.85	.005[cj]				
SEM		6.6	.033	.079				

[a] Least-squares means.
[b,c,d] Means with unlike superscripts differ (P<.001).
[ef] Means with unlike superscripts differ (P<.01).
[gh] Means with unlike superscripts differ (P<.05).
[ij] Means with unlike superscripts differ (P<.05).

heifers as the calving season progressed. Another possibility would be a change toward wetter, muddier weather conditions later in the calving season.

Calves nursing 3-, 7- and 8-year-old cows required more treatments for sickness than calves nursing 4 to 6 and 9-year-old cows (P<.001, Table 3). It is tempting to suggest that the level of immunity provided to the calves is greatest in the prime age cows (4 to 6 year olds) and decreases as the cows age. However, the fact that the 34 calves nursing 9-year-old cows had the lowest treatment rate prevents such a generalization.

A more detailed summary of production records from South Dakota herds is found in paper CATTLE 91-21 in this report.