1987

Effects of Body Condition on Reproductive Performance of Range Beef Cows

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BEEF REPORT

EFFECTS OF BODY CONDITION ON REPRODUCTIVE PERFORMANCE OF RANGE BEEF COWS

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CATTLE 87-9

Summary

Simmental-Angus crossbred cows were fed differing levels of nutrition from December to May in each of 3 years to create a wide range in cow body condition or fleshiness at the beginning of the calving season (beginning mid-March) and when turned to summer pasture (early May) 1 month prior to the beginning of the breeding season (early June). Cows that were fleshier in March, May or June cycled earlier. Cows that were fleshier at the beginning of the breeding season calved earlier the following years. For cows that calved late in the calving season, body condition prior to calving, in early May and at the beginning of the breeding season were all closely related to when they calved the following year. Cows that calved early in the calving season were able to withstand more nutritional stress, as body condition prior to calving and in May had less of an effect on calving interval than did body condition at the beginning of the breeding season.

(Key Words: Beef Cow, Body Condition, Reproduction, Nutrition.)

Introduction

Many researchers have shown that body condition of beef cows affects reproductive performance. Previous studies have linked higher cow body conditions with shorter intervals from calving to first estrus and increased percentage of cows pregnant. It is not clear as to the minimum degree of body condition at various stages of production that will lead to adequate reproductive performance under different conditions.

The objectives of this study are to (1) establish the minimum cow body condition before calving and breeding necessary for adequate reproductive performance and (2) evaluate subjective and objective measurements to describe body condition of beef cows. The results reported in this paper relate to objective 1.

Materials and Methods

Simmental-Angus crossbred cows wintered at the SDSU Range and Livestock Research Station near Cottonwood and summer grazed near Sturgis, South Dakota, were allotted each December by age and previous calving date to one of two levels of early winter nutrition. Within 1 week following calving, cows were reallotted by calving date, calf sex, cow age and early winter treatment to one of two late winter treatments fed until early May. Early and late winter treatments were designed to create a wide range in cow body condition prior to calving and in early May.

All cows grazed native range as a group from early May to early December each year. The 60 to 70-day breeding season began on June 6 each year. For the first 2 years, cows were exposed to Charolais bulls. During the third year, cows were observed for estrus for the first 25 days of the breeding season and artificially inseminated to Simmental or Angus bulls. Cows were then exposed to Simmental or Angus bulls for the remainder of the breeding season.

Cow body condition scores (table 1), cow weights (after overnight withdrawal from feed and water), backfat needle probes (Cook's probe taken between 12th and 13th ribs) and weight:height ratios (weight:height at top of the hook bones) were monitored monthly from December through July. Blood from each cow was collected twice monthly (7-10 days apart) in early May, June and July for detection of cyclic activity via serum progesterone as determined by radioimmunoassay. Only records from cows nursing calves were included in statistical analyses.

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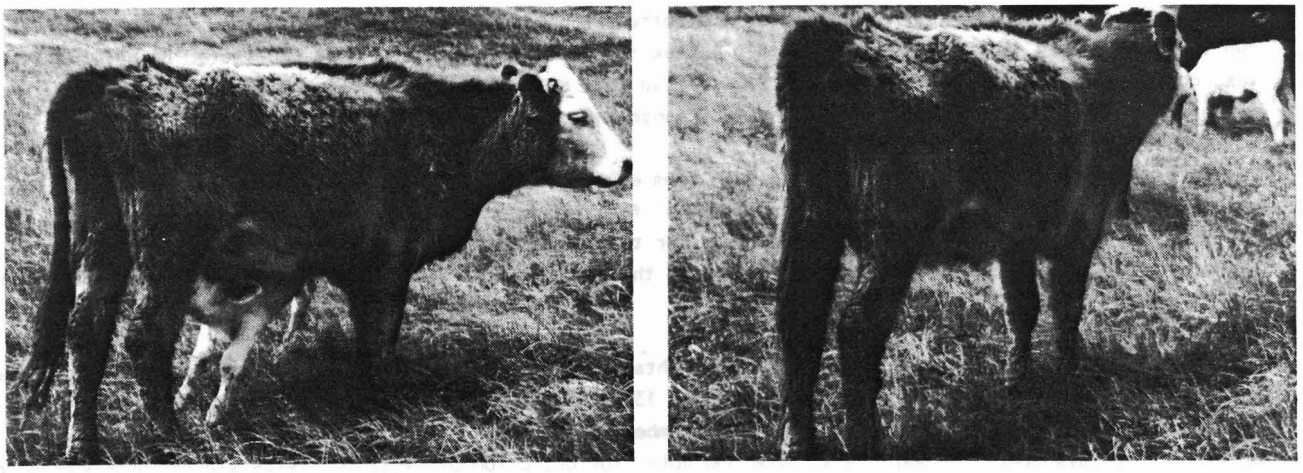
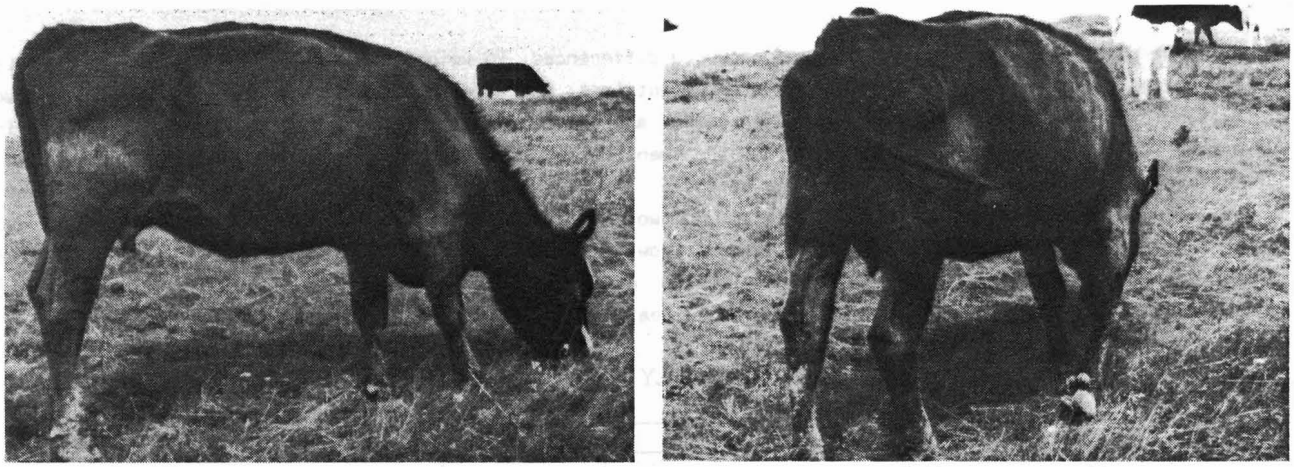
TABLE 1. BODY CONDITION SCORING SYSTEM FOR BEEF COWS

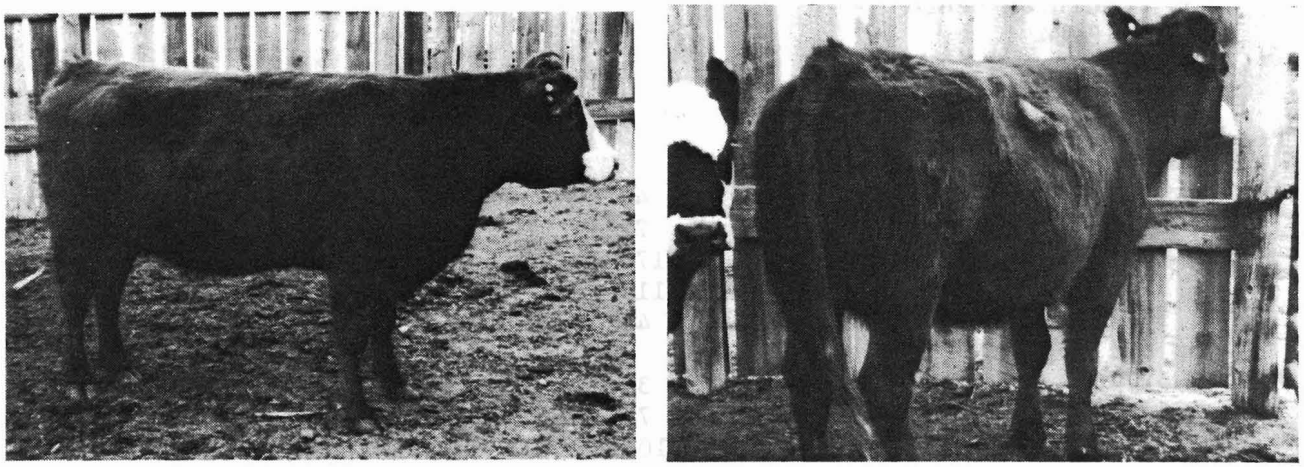
Score	Description
1	Severely Emaciated. Individual spinous processes, shoulder, rib and hip bones are obvious. No apparent fat cover. Shoulder, loin and rearquarter muscle has marked atrophied appearance. Physically weak.
2	Extremely Thin. Same as 1 but not weakened.
3	Very Thin. Individual spinous processes, shoulder, rib and hip bones are obvious. No apparent fat cover. Only slight muscle atrophy.
4	Slightly Thin. Individual spinous processes no longer apparent. Rear ribs, hip and pin bones evident. Slight fat cover over shoulder and foreribs only. No visible muscle atrophy.
5	Moderate. Last two ribs noticeable. Small amount of fat over shoulder, foreribs and loin. Slight or no fat in brisket or over hip and pin bones.
6	Slightly Fleshy. Individual ribs are not evident. Moderate fat covering over shoulder, loin and foreribs. Some fat in brisket and over last few ribs and hip bones.
7	Fleshy. Very smooth profile due to fat deposits. Considerable fat covering over shoulder, rib, loin and hip. Fat fills out brisket, flanks and tailhead.
8	Obese. When viewed from behind, back and hips have square appearance and tailhead is full due to excessive fat deposits. Flanks appear deep and brisket is full and distended with fat.
9	Very Obese. Excessive fat deposits cause a rippled appearance over loin, hip and tailhead. Neck appears short due to fullness of brisket. Heavy deposition of udder fat noticeable in dry cows.



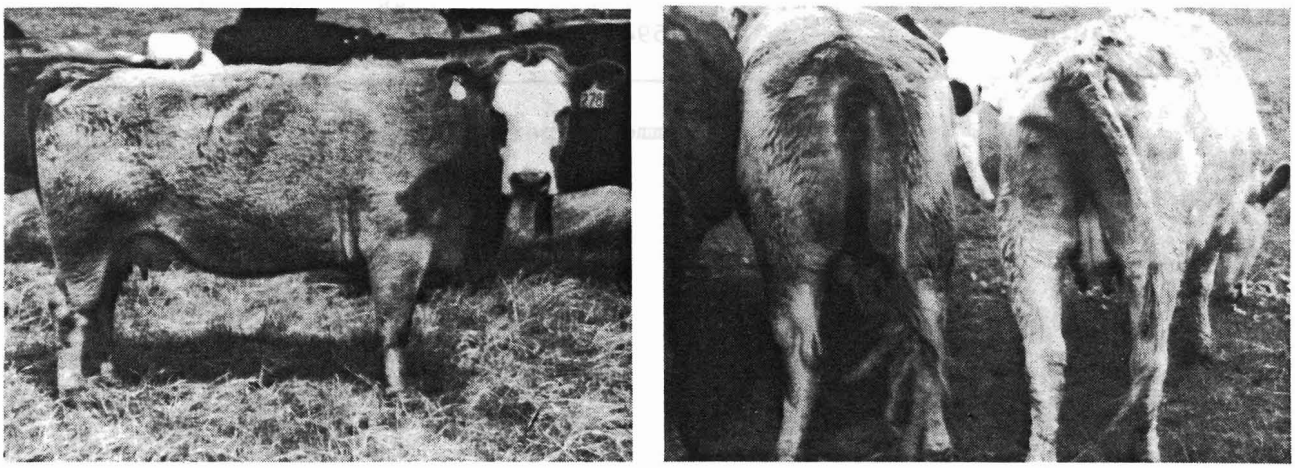
CONDITION SCORE 1



CONDITION SCORE 3



CONDITION SCORE 5



CONDITION SCORE 7

(Condition score 2 on right)

Results and Discussion

The nutritional treatments imposed produced differences in weight change and body condition (tables 2-4). Those treatments that produced greater winter weight loss and lower body condition scores resulted in fewer cows cycling prior to and during the breeding season and longer calving intervals. The 53 lb difference in total winter weight change caused by nutrition treatment during the first year of the study did not result in a difference in calf growth rate or weaning weights. The 70- and 121-lb differences in total winter weight change produced by nutritional treatments in the second two years of the study resulted in reduced calf growth during the late winter treatment period. This lower calf growth did translate to lower calf weaning weights in the fall. During the third winter (table 4) the detrimental effects of low nutrition after calving were more severe for those cows that were also on low earlier winter treatments.

TABLE 2. EFFECTS OF EARLY AND LATE WINTER TREATMENTS (1984-85)

Early winter treatment	High		Low	
Late winter treatment	High	Low	High	Low
No. cows	18	19	21	19
Cow wt, lb. 12/13/84	1030	983	1021	1045
Cow condition score				
12/13/84	5.4	5.2	5.4	5.4
3/12/85	5.8^{a}	5.6^{b}	5.4^{b}	5.0^{b}
5/7/85	5.4^{a}	4.6^{b}	4.5^{b}	4.2^{b}
6/5/85	5.1	4.7	4.5	4.9
Cow wt change, lb				
12/13/84-2/15/85	46^{a}	51^{a}	-11^{b}	-42^{c}
2/15/85-3/12/85	22^{a}	15^{a}	42^{b}	53^{b}
3/12/85-5/7/85	-176$_{a}$	-191$_{ab}$	-172$_{bc}$	-174$_{c}$
12/13/84-5/7/85	-114^{a}	-134^{ab}	-145^{bc}	-167^{c}
5/7/85-6/5/85	46^{ab}	57^{ab}	31^{a}	64^{b}
Cow cycling, %				
5/7/85	33$_{a}$	37$_{ab}$	10$_{b}$	26$_{b}$
6/5/85	75^{a}	56^{ab}	33^{b}	35^{b}
7/2/85	100	100	90	100
Cows pregnant, %				
Fall 1985	100$_{a}$	100$_{ab}$	90$_{b}$	100$_{b}$
Calving interval, 1985-86	362^{a}	368^{ab}	372^{b}	373^{b}
Calf gain, lb/day				
Calving-5/7	2.13	1.98	2.18	2.11
Calf weaning wt, lb	594	585	596	590

^{a,b,c} Means in a row without common superscripts differ (P<.05).

TABLE 3. EFFECTS OF EARLY AND LATE WINTER TREATMENTS (1985-86)

Early winter treatment	High		Low	
Late winter treatment	High	Low	High	Low
No. cows	25	23	22	24
Cow wt, lb, 12/9/85	1030	1047	1012	1012
Cow condition score				
12/9/85	5.7	5.3^{ab}	5.6^{bc}	5.4
3/7/86	5.5^{a}	5.1^{b}	4.9^{bc}	4.6^{c}
5/9/86	4.5^{a}	3.6^{b}	4.1^{a}	2.9^{c}
6/5/86	5.3^{a}	4.6^{b}	5.1^{a}	4.1^{c}
Cow wt change, lb				
12/9/85-2/7/86	29^{a}	33^{a}	-40^{b}	-40^{b}
2/7/86-3/7/86	-22^{a}	-18^{a}	4^{b}	7^{b}
3/7/86-5/9/86	-130^{a}	-180^{c}	-106^{b}	-158^{c}
12/9/85-5/9/86	-121^{a}	-165^{b}	-143^{ab}	-191^{c}
5/9/86-6/5/86	119	125	121	112
Cows cycling, %				
5/9/86	20	13	9	4
6/5/86	56^{a}	48^{ab}	50^{a}	25^{b}
7/2/86	80^{a}	61^{ab}	77^{ab}	54^{b}
Percent pregnant, fall 1986	92	96	95	100
Calving interval, 1986-87	367^{ab}	369^{ab}	362^{a}	372^{b}
Calf gain, lb/day				
Calving-5/9	2.13^{a}	1.39^{c}	1.83^{b}	1.10^{c}
Calf weaning wt, lb	616^{a}	605^{b}	598^{b}	565^{c}

^{a,b,c} Means in a row without common superscripts differ (P<.05).

TABLE 4. EFFECTS OF EARLY AND LATE WINTER TREATMENTS (1986-87)

Early winter treatment	High		Low	
Late winter treatment	High	Low	High	Low
No. cows	25	24	21	24
Cow wt, lb, 12/13/86	1133	1135	1133	1115
Cow condition score				
12/5/86	6.2	6.4	6.2	6.3
3/6/87	6.2[a]	6.0[a]	5.3[b]	5.2[b]
5/8/87	4.8[a]	3.6[b]	4.5[a]	2.5[c]
6/5/87	5.0[a]	4.3[b]	4.4[ab]	3.4[c]
Cow wt change, lb				
12/5/86-2/13/87	53[a]	48[a]	-8[b]	-40[c]
2/13/87-3/6/87	21[a]	15[a]	42[b]	51[b]
3/6/87-5/8/87	-233[a]	-310[b]	-198[c]	-264[d]
12/5/86-5/8/87	-174[a]	-253[b]	-218[c]	-295[d]
5/8/87-6/5/87	62[a]	86[b]	75[ab]	84[b]
Cows cycling, %				
5/7/85	32[a]	17[ab]	24[a]	4[b]
6/5/85	72[a]	42[b]	62[a]	13[c]
7/2/85	96[a]	96[a]	95[a]	63[b]
Calf gain, lb				
Calving-5/8	2.27[a]	1.25[b]	2.07[a]	.97[c]

[a,b,c] Means in a row without common superscripts differ (P<.05).

To help evaluate the importance of body condition under different situations, we have analyzed our results separately for those cows that calved early in the calving season (greater than 60 days from calving to the beginning of the breeding season) and late calving cows (less than or equal to 60 days from calving to the breeding season). The information in table 5 indicates that condition score is closely related to the percentage of cows cycling prior to and during the breeding season with fleshier cows having a greater chance of cycling. For late calving cows, interactions (P<.05) between body condition prior to calving and body condition in May and June for cycling indicated that, if cows are thin (condition score 4) at calving, an increase in body condition after calving is more important than for moderate or fleshy cows.

Pregnancy rates were surprisingly high for the first 2 years of this study (>95%) despite average winter weight loss of as much as 19% of cow weight for one combination of treatments during the second year. Pregnancy rate was not affected by body condition.

The effect of body condition on when cows will calve the following year (indicated by calving interval) is less dramatic. In general cows with higher condition scores had shorter calving intervals (table 5).

TABLE 5. EFFECT OF CONDITION SCORE ON PERCENTAGE CALVING AND CALVING INTERVAL

Condition score	No. of cows	% cycling May	% cycling June	% cycling July	No. of cows	Calving interval, days
Early calving cows[a]						
March condition score (prior to calving)						
≤4	45	10.0^{d}	28.2^{d}	70.5^{d}	38	379^{d}
5	84	17.8^{d}	43.5^{d}	85.6^{e}	46	373de
6	43	41.9^{e}	77.5^{e}	97.5^{e}	23	375de
≥7	25	45.9^{e}	76.6^{e}	94.7^{e}	13	365^{e}
May condition score (end of late winter treatment)						
≤2[b]	27	0.0^{d}	26.6^{d}	69.5^{d}		
3	48	11.6^{de}	30.9^{de}	78.5^{de}	39	379^{d}
4	62	24.4^{ef}	47.4^{e}	89.7^{ef}	37	374^{d}
5	45	44.9^{g}	77.8^{f}	93.6^{f}	33	374^{d}
≥6	15	44.6^{fg}	86.2^{f}	93.2^{fg}	11	361^{e}
June condition score (the beginning of the breeding season)						
≤3	27	2.9^{d}	14.9^{d}	57.0^{d}	11	379
4	74	16.5^{d}	43.2^{e}	86.5^{e}	39	378
5	75	31.0^{e}	60.5^{f}	93.6^{e}	53	372
≥6	21	56.9^{f}	92.5^{g}	90.7^{e}	17	371
Late calving cows[c]						
March condition score (prior to calving)						
≤4	14	0.0	0.0^{d}	44.7^{d}	11	365
5	41	7.5	26.0^{de}	74.4^{e}	29	353
6	22	0.0	35.3^{ef}	98.5^{f}	8	349
≥7	6	0.0	65.8^{f}	99.1^{f}	5	355
May condition score (end of late winter treatment)						
≤2[b]	9	12.3	0.0^{d}	25.8^{d}		
3	16	0.0	6.9^{de}	63.6^{e}	14	364^{d}
4	27	4.8	31.2^{e}	88.2^{f}	20	350^{e}
5	25	4.2	41.6^{e}	90.7^{f}	3	357de
≥6	6	0.0	39.2^{de}	92.2^{ef}	6	345^{e}
June condition score (the beginning of the breeding season)						
≤3	12	.2	0.0^{d}	48.1^{de}	7	365
4	22	9.5	22.2^{ef}	67.2^{ef}	9	355
5	41	2.3	29.5^{f}	87.1^{f}	29	353
≥6	8	.7	66.5	100.0	8	352

[a] Greater than 60 days after calving at the beginning of the breeding season (June).

[b] Means for calving interval are for condition scores ≤3.

[c] Less than or equal to 60 days after calving at the beginning of the breeding season (June).

[d,e,f,g] Means within column and month of condition score without common superscripts differ ($P<.05$).

When weight-height ratio was used to evaluate relationships between body condition and calving interval, the graphs shown in figures 1 and 2 were produced. As weight-height ratio at the beginning of the breeding season increased, calving interval decreased ($P<.05$). There was only a slight improvement in calving interval when weight-height ratios were greater than 19 lb/inch, which translates to a condition score 4. For early calving cows, weight-height ratios prior to calving in March and a month prior to the breeding season were not closely related to calving interval ($P>.20$). Body condition prior to calving and in May was closely related to calving interval ($P<.05$) for the late calvers. A weight-height ratio greater than 20 lb/inch prior to calving (condition score 4) or greater than 18 lb/inch in May (condition score 4) produced only slight decreases in calving interval. (Weight of the fetus and differences in gut fill between months will affect the relationship between weight-height ratio and condition score.)

It should be noted that in this study cows were reallotted each fall to winter nutritional treatments. Although high pregnancy rates were achieved, the cumulative effects of extended calving intervals for cows that are thin every year could eventually result in lower pregnancy rates. All cows in this study were grazing native range that allowed cows to gain weight for 30 days prior to and during the breeding season. In those cases where such weight gain is possible, the minimum body condition at the beginning of the breeding season appears to be a weight-height ratio of 19 lb/inch or a condition score 4.

For cows that calve early in the calving season, body condition at calving time does affect how soon they begin to cycle but not necessarily calving interval. Although not the original intent of this study, it demonstrates the importance of managing yearling heifers to calve early in the calving season as two-year-olds to have a high likelihood of being pregnant in subsequent years. In this study cows that calved early were able to withstand more nutritional stress (or lower body condition) during the winter without a detrimental effect on when they calved the following year. For cows that calve later in the calving season, how soon they cycle following calving may limit how early they calve the following year. So body condition at calving becomes more important. A weight-height ratio of 20 lb/inch (weight includes fetal weight) or a condition score 4 appears to be the minimum body condition at calving time to prevent longer calving intervals.