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Influence of Body Condition on Reproductive Performance of Beef Cows

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Introduction

It has been understood for decades that reproductive performance is the most important aspect affecting production efficiency of a cow-calf enterprise. To maintain a calving interval of 365 days, a cow must re-breed in 80 to 85 days after calving. The priorities of nutrient utilization in a beef cow are: body maintenance, growth, lactation, fetal growth, breeding, and body reserve according to Short et al., (1990). The energy reserves of the beef cow at calving has been identified as the single most important factor affecting postpartum interval to estrus and re-breeding success in beef cows.

Body Condition Score

Body condition scoring (BCS) is an effective management tool to estimate of the energy reserves of the cow. The most commonly used BCS system for beef cattle in the United States use scores from 1 to 9 (Table 1), with 1 being emaciated and 9 being obese (Whitman, 1975). Examples of cows in BCS of 3, 5 and 7 are shown in Photos 1-3. Using BCS to evaluate cattle does not require any special equipment and can be conducted anytime during the year. Poor body condition is associated with reduced income per cow, increased postpartum interval, increased dystocia, and lower weaning weight.

The relationship between a cow's BCS and total income of a cow herd are shown in Table 2 (Kunkle et al., 1994). As BCS decreased, both the pregnancy rates and the weaning weights declined. This combination resulted in dramatic reduction in income per cow exposed.

Table 1. Key Points for Condition Scoring Beef Cows.

Reference Point	Condition Score								
	1	2	3	4	5	6	7	8	9
Physically weak	Yes	No	No	No	No	No	No	No	No
Muscle atrophy [a]	Yes	Yes	Slight	No	No	No	No	No	No
Outline of spine visible	Yes	Yes	Yes	Yes	Slight	No	No	No	No
Outline of ribs visible	All	All	All	3-5	1-2	0	0	0	0
Fat in brisket and flanks	No	No	No	No	No	Some	Full	Full	Full
Outline of hip and pin bones visible	Yes	Yes	Yes	Yes	Yes	Yes	Slight	No	No
Fat in the udder and patchy fat around tail head	No	No	No	No	No	No	No	Slight	Yes

[a] Muscles of loin, rump and hindquarter are concave, indicating loss of muscle tissue.
(Pruitt and Momont, 1988)

Photo 1

Body Condition Score 7

Photo 2

Body Condition Score 5

Photo 3

Body Condition Score 3

Table 2. Relationship of body condition score (BCS) to beef cow performance and income.

BCS	Pregnancy rate, %	Calving interval, d	Calf ADG, lb.	Calf WW, lb.	Calf Price, $/100 lb.	$/Cow Exposed [a]
3	43	414	1.60	374	96	154
4	61	381	1.75	460	86	241
5	86	364	1.85	514	81	358
6	93	364	1.85	514	81	387

[a] Income per calf x pregnancy rate.

(Kunkle et al., 1994)

Ideal BCS for Mature Cows

What is the optimum body condition score for mature beef cows? Lamond (1970) proposed the concept of a target BCS at calving. Numerous researchers have studied the minimum BCS for acceptable reproductive performance. Dzulk and Bellows (1983), Richards et al. (1986), Houghton et al. (1990) and Morrison et al. (1999) reported that a BCS of 5 at calving is the critical level affecting subsequent reproductive performance in mature beef cows.

Morrison et al., (1999) grouped mature beef cows into three groups based on their BCS (≤4, 5 or 6, or ≥7) ninety days before calving. The groups were all managed so that each cow would calve with a BCS of 5 or 6. They found that pregnancy rates at 20, 40, or 60 days after the start of the breeding season were similar across the three groups. Calf birthweights and weaning weights were also similar. These researchers concluded that large change in BCS pre-calving did not affect subsequent reproduction as long as the cows had a BCS of at least 5 at calving.

Cow BCS at calving also affects the length of time from calving until the return to estrus, or postpartum interval (PPI). Houghton et al. (1990) showed that thin cows (BCS < 5) exhibiting an extended PPI of over 80 days, which represents a postpartum anestrous interval 28 to 58 days longer than that exhibited by either moderately conditioned or fleshy cows (BCS > 5) (Table 3). In order to maintain a calving interval of one calf every year, cows need to maintain a PPI of 60 days or less, which according to that study would indicate a calving BCS of at least a 5.

Table 3. Effect of Body Condition Score (BCS) at parturition on Postpartum Interval (PPI)

BCS	PPI, days
3	88.5
4	69.7
5	59.4
6	51.7
7	30.6

(Adapted from Houghton et al., 1990)

Whether or not a cow calves early or late in the calving season influences the effect of BCS at calving on reproductive performance. Pruitt and Momont (1988) found that early calving cows can be slightly thinner than late calving cows simply because they have additional time to re-cycle and rebreed (Table 4). Early calving cows are defined as cows which have calved in the first 21 days and late calving cows are defined as any other cows.

Table 4. Effect of Body Condition Score on Percentage of Cows Cycling.

BCS*	No. of cows	% of Cows Cycling		
		May	June	July
Early Calving Cows				
≤ 4	45	10.0	28.2	70.5
5	84	17.8	43.5	85.6
6	43	41.9	77.5	97.5
≥ 7	25	45.9	76.6	94.7
Late Calving Cows				
≤ 4	14	0.0	0.0	44.7
5	41	0.0	26.0	74.4
6	22	0.0	35.3	98.5
≥ 7	6	0.0	65.8	99.1

* BCS assigned in March prior to calving

(Pruitt and Momont, 1988)

What are the opportunities to change BCS to improve the probability of cows getting pregnancy? Houghton et al. (1990) found that thin cows gaining condition increased the probability of cows getting pregnancy and fleshy (fat) cows losing condition improved pregnancy rates (Table 5). The key to maintaining BCS and to optimum reproductive performance is evaluating cows early. Wiltbank, (1982) illustrates the concept of weight gain necessary for cows of varying BCS prior to calving (Table 6).

Table 5. Effect of Postpartum Condition Score Change on Pregnancy Rate

BCS status	Pregnancy (%)
Thin (<5) & increasing CS	100
Fleshy (>5) & increasing CS	75
Thin (<5) & decreasing CS	69
Fleshy (>5) & decreasing CS	94
Moderate (4.5-5.5) & maintaining	100

(Adapted from Houghton et al., 1990)

Table 6. Necessary Weight Gains in Pregnant Cows in Different Body Conditions.

Body Condition		Calf Growth*	Weight Gain Needed to Calving, lb			
At Weaning	Needed @ Calving		Body Weight, lbs	Total	Days to Calving	ADG, lbs
Thin (< 4)	Moderate	100	160	260	120	2.2
Borderline (4)	Moderate	100	80	180	120	1.5
Moderate (5-6)	Moderate	100	0	100	120	0.8
Thin (< 4)	Moderate	100	160	260	200	1.3
Thin (< 4)	Moderate	100	160	260	100	2.6

* Calf Growth includes calf, fluid and membranes
(Wiltbank, 1982)

Utilizing BCS to Improve Cost Effectively Improve Reproductive Performance

The periodic monitoring of the BCS of a cowherd can be an especially effective tool to help cow calf producers optimize the reproductive performance of their cows while also avoiding excessive spending on feed. Some suggestions for how to utilize BCS during various production periods are listed in Table 7.

One of the biggest advantages to evaluating BCS during these critical time periods is providing an early warning system to producers to help guide management decisions. For instance, if cows are unacceptably thin at weaning, that is an indication that there is an imbalance between a ranch's feed resources and the herd's nutrient requirements during lactation. Cows that are too thin at calving would indicate that the herd's feeding program during mid- to late-gestation needs to be re-evaluated.

Sorting cows into groups based on body condition is a sound practice to optimize production and costs. Cows in thin condition (BCS<4) could be fed at a higher plane of nutrition to reach the desired target. This allows

Table 7. How to Utilize Body Condition Scores at Various Stages of Production.

Production period	Management
Late Lactation (2 month prior to weaning)	Depending upon current forage availability, supplementations and/or a modified weaning strategy may be necessary. Wean thin cows, especially young and older
Weaning	Pay particular attention to young cows weaning their first calf and cows beyond their prime age: they are most likely to be thin at this time.
100 days before calving	Last opportunity to gain body condition. This would be a good time to separate thin cows from cows in good condition and increase feed to thin cows.
Calving	If cows are thin, a change in the feeding program is needed. It is expensive to increase condition on thin cows after calving.
Breeding season	If cows are thin at this time, additional supplementation and/or implementation of an early weaning strategy may be necessary.

(From Blasi et al.)

the manager to allocate feed resources to those cattle with the highest probability of a response. Increasing the energy reserves of these cows should result in improved re-breeding next year.

At the same time those cows with a BCS of 5 or greater would not require additional feed inputs to increase their body reserves. This is especially valuable when feed is either scare or expensive. Providing more inputs into cows that are in moderate or higher condition will generally not increase production enough to justify the additional expense.

How much additional energy is required to change body condition on a cow? The data in Table 8 shows how many additional Mcal of Net Energy for Maintenance (NEm) are required to change the body condition scores of beef cows. The amount of energy needed to add condition to a thin cow is less than that necessary for a cow with a higher BCS. This is because the weight that is gained by a thin cow is mostly water and protein while any weight increases in a higher conditioned cow contains a higher proportion of fat.

Table 8. Mcal NEm Required to Change Body Condition Scores of Beef Cows

Body Condition Score	Cow Body Weights (Pounds)						
	900	1000	1100	1200	1300	1400	1500
2	114	126	139	151	164	177	189
3	129	143	157	172	186	200	214
4	147	163	180	196	212	229	245
5	170	188	207	226	245	264	283
6	198	220	242	264	286	308	330
7	234	260	285	311	337	363	389
8	280	311	342	373	405	436	467
9	342	380	418	456	494	532	570

Body weights for cow condition scores 1 through 9 are 76.5, 81.3, 86.7, 92.9, 100, 118.1, 129.9 and 144.3 percent of condition score 5, respectively. *(NRC, 1996)*

For example, a 1400 pound cow in late gestation would require approximately 12 Mcal NEm to maintain her body condition. If this cow were in a body condition score 4, it would take an additional 264 Mcal to move her to a BCS 5. How much the energy density of the ration needs to increase depends on the length of time available to achieve the desired increase. Table 9 illustrates how much additional energy per day is required for the 1400 pound cow described above to add one BCS in either 30, 60, or 90 days. If we assume that feed intake for that cow is about 27 pounds per day, feeding her an alfalfa-grass mix hay ration should support adding one BCS if we allow 90 days for that change to occur. Shorter time frames require higher energy densities. A sixty day period would require feed with similar energy content as 100% alfalfa hay, while adding one BCS in 30 days would require a ration similar to corn silage.

Table 9. Impact of Feeding Period Length on Energy Requirements to Change BCS 4 to 5 (1400 pound cow, late gestation)

Energy Requirements	90 Days	60 Days	30 Days
Base Maintenance Requirement (Mcal NEm per Day)	12	12	12
Additional NEm Required to Change Body Condition (Mcal/day)	2.9	4.4	8.8
Diet Energy Density Required (Mcal/pound, assuming 27 pounds intake)	0.55	0.61	0.77

Conclusion

Body condition scores are an excellent indicator of reproductive performance. Evaluating cows/heifer early allows producers to make management decision to change BCS as needed. Cows calving earlier in the calving season allows cows more time to cycle and re-breed prior to breeding season.

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