Impact of Body Condition at Calving on Reproductive Productivity in Beef Cattle

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Overview:

A late spring frost and a hot dry summer experienced in much of the Midwest left many beef producers with less available stored feed for the winter months. Additionally, much of the stored forage is of low quality and includes alternative forage sources such as baled corn stalks and soybean straw. Given this scenario, without proper management, there is the potential that the nutritional requirements for late gestating and early lactating cows will not be met, resulting in loss of body condition prior to calving and the spring breeding season. With the increased costs of buying additional hay or providing a feed supplement, producers might be tempted to "just get by" which would result in cows losing body condition during the winter. However, such a decision, or lack of action, will in fact be more costly in the long run. Reproductive performance is greatly impacted by total body energy reserves (body condition) at specific times during the production cycle. If cows are thin at calving, reproductive performance in the subsequent breeding season will suffer, resulting in reduced yearly profits per cows. Therefore, to optimize reproductive performance next spring, producers may need to consider winter supplementation strategies that meet the nutritional requirements of their cow herd and ensure optimal breeding performance this spring.

Impact of Body Condition on Reproduction:

Numerous research studies have indicated that under-nutrition due to limited feed availability or poor-quality feed sources during late gestation (prepartum) and/or early lactation (postpartum) has detrimental effects on subsequent reproductive efficiency. Reproductive performance is closely linked to the amount of available energy reserves a cow has which is reflected by her amount of body fat. The most practical method to estimate the energy reserves of cows is by evaluating the proportion of body fat via body condition scoring (BCS). BCS are based on a numeric scale of 1 to 9, with cows with 1 being extremely thin and 9 being obese. For more information of how to accurately assign BCS please view the Purdue University Extension video at the following web address: http://forageshortage.com

It is important to evaluate the BCS of your cow herd at least monthly to determine if cows are losing or gaining body condition. This will allow you to adjust your nutritional management accordingly during the prepartum and postpartum periods. For optimal reproductive performance during the subsequent breeding season, mature cows should be a BCS of 5 to 5.5 and first calf heifers should have a BCS of 5.5 to 6 at calving and through the breeding season.

Table 1. ***Net energy of maintenance (NE_m; Mcal/d) and crude protein (CP; lb/d) requirement of a 1200 lb cow during gestation and early lactation*** [a].

	NE_m (Mcal/d) [b]	CP (lb/d) [c]
Mid-Gestation	8.68	1.4
Late Gestation	10.83	1.7
Early Lactation (10 lbs milk/d)	12.09	2.1
Early Lactation (20 lbs milk/d)	15.48	2.7

[a] Adapted from the NRC, Nutrient Requirements of Beef Cattle.
[b] Daily energy (Mcal/d) required for maintenance.
[c] Daily crude protein required for maintenance.

Frequently assessing BCS in the winter is critical as this time corresponds to the third trimester of pregnancy for most spring calving herds. As pregnancy proceeds, the nutritional requirement for both net energy and crude protein increase to support fetal and placental growth (Table 1). Environmental stressors such as extreme cold, wind chill and/or wet weather further add to the nutritional requirements of the beef herd. If intake of energy and/or protein is below that required to meet the cow's needs for maintenance, pregnancy or lactation, and environmental stress, cows will try to compensate by mobilizing stored energy (body fat) and will therefore lose body condition. Following calving, the nutritional requirements again increase to support lactation and repair of the reproductive tract. Therefore, if cows are thin at calving, due to sub-maintenance energy intake during late gestation, the increased demand for energy and protein to support lactation will make it even more difficult and expensive to adjust body condition between calving and the beginning of the breeding season. Therefore, it is critical that the body condition monitored and adjusted prior to calving to ensure that adequate nutrition is delivered and that cows are in proper condition by calving. If cows are thin prior to calving, supplementation is necessary to regain body condition.

Table 2. ***Weight gains needed in mature cows to achieve proper BCS at calving*** [a].

Body Condition		**Weight Gain Needed**				
At Weaning	**Needed at Calving**	**Fetus & Placenta (lb)**	**Body Wt** [b] **(lb)**	**Total Wt** [b] **(lb)**	**Days to Calving**	**ADG**[c]
5	5	100	0	100	120	0.8
4	5	100	80	180	120	1.5
3	5	100	160	260	180	0.9
3	5	100	160	260	150	1.7
3	5	100	160	260	120	2.2
3	5	100	160	260	90	2.9

[a] Adapted from Wiltbank, 1982
[b] WT = Weight
[c] Average Daily Gain needed across the scale to support fetal growth and BCS change.

As a general rule of thumb, it will take 80 lbs of body weight gain for a mature cow and 150 lbs of gain for a first calf heifer to gain 1 BCS. However, this

estimate does not take into account the additional nutritional requirements needed to support the advancing pregnancy. As illustrated in Table 2, the amount of BCS needed to be gained and the time available between weaning and calving will dictate the aggressiveness of the nutritional program. Providing additional nutrients during this period can increase costs; however this additional nutrition is needed to ensure optimal reproductive performance. Feed costs can be reduced following the breeding season, once the cows conceive.

Failing to achieve an adequate BCS at calving can negatively impact various aspects of reproductive performance. A major constraint to reproductive efficiency in a beef herd is the duration between calving and the resumption of normal estrous cycles and ovulation, referred to as the postpartum interval. To maintain a 12-month calving interval, a cow must conceive within 80 to 85 days of calving. If the interval from calving until resumption of normal estrous cycles is extended past 85 days the calving interval will be extended as well. Failing to maintain cows in appropriate body condition results in an extended period of postpartum anestrus and an extended postpartum interval. This is illustrated in Table 3 and 4. In Table 3, as BCS at calving decreases, postpartum interval increases. Data in Table 4 demonstrates that if cows are thin (BCS ≤ 4) at calving, only two-thirds will have resumed normal estrous cycles by 90 day post-calving. Collectively these data clearly demonstrate that thin cows take longer to exhibit estrus following calving resulting in an extended calving interval and a failure to achieve one calf per cow every 12 months. Moreover, an extended

Table 3. ***Effect of body condition score (BCS) at calving on postpartum interval*** [a].

BCS	Postpartum Interval [b]
3	**88.5**
4	**69.7**
5	**59.4**
6	**51.7**
7	**30.6**

[a] Adapted from Houghton et al., 1990 Purdue University
[b] Average day post-calving when cows resumed normal estrous cycles

Table 4. BCS at calving and percent of cows that have shown estrus after calving [a].

		% Shown Estrus	
BCS at Calving	**Number Cows**	**60 days post-calving**	**90 days post-calving**
Thin (≤ 4)	272	46	66
Good (5 -6)	364	61	92
Fat (≥ 7)	50	91	100

[a] Adapted from Whitman, 1975 Colorado State University

postpartum interval due to inadequate body condition also results in fewer cows returning to estrus during the breeding season, ultimately resulting in fewer cows getting rebred. This is illustrated in Figure 1, which shows the percentage of cows that were rebred in six research herds (four states) and includes both mature and young cows. These data clearly indicate that BCS at calving considerably influences the percentage of cows getting rebred in the subsequent 60 to 90 day breeding season. These data and numerous other data sets conclusively show that cows in poor body condition at calving have poorer reproductive performance in the subsequent breeding season. To increase the likelihood of a successful pregnancy some producers may consider increasing the length of the breeding season for cows that are in poor body condition. This is not recommended as cows in poor body condition will not rebreed at acceptable levels unless the cows are heavily supplemented during the breeding season to increase body fat reserves. Extending the breeding season will also result in lower milk production, smaller/lighter calves at weaning, and extended calving interval the next year, which further reduces the likelihood the cows will rebred next year.

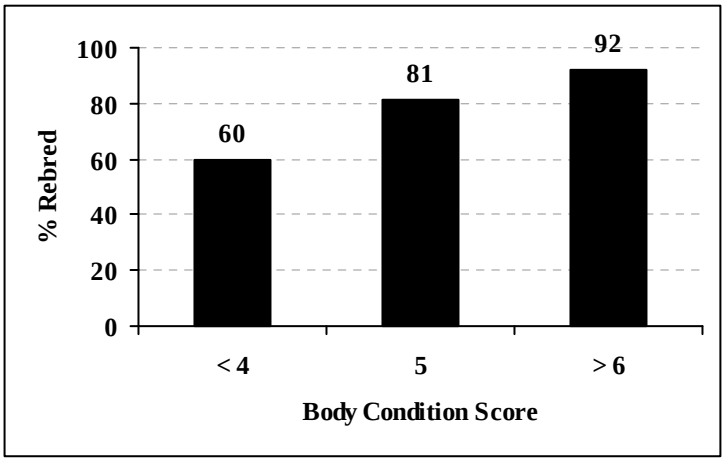

Figure 1. Percent of cows rebred in the subsequent breeding season according to BCS at calving (summary of six trials in 4 states). Adapted from G. Selk, Oklahoma State Univer. Oklahoma Cooperative Extension Service Publication ANSI-3283

In addition to poor reproductive performance of the beef cow, body condition also affects the performance of her calf. Cows in poor body condition at calving have smaller calves that are weaker and more susceptible to disease. Thin cows have both lower quality and quantity of colostrums and produce less milk during lactation. These factors together result in reduced weaning weights of calves from thin cows. Furthermore, thin cows that get pregnant following an extended postpartum interval will have calves that are younger and smaller at weaning the following year.

Taking into account the problems associated with thin cows at calving, as outlined above, the economic ramifications can be substantial. The impact that BCS at calving has on reproductive efficiency, calf performance, and farm income is presented in Table 5. Thin cows (BCS 3 and 4) have reduced pregnancy rates, increased calving intervals, wean a younger/lighter calf, and provide considerably less yearly income compared to cows that are in good condition (BCS 5 and 6) at calving. The income per cow is reduced by over $140 when BCS decreases from a 5 to a 4. Therefore, the extra expense of supplemental feeds during the winter months is recaptured in the yearly profitability of the cows. The improvement in reproductive efficiency of cows maintained in good body condition is

substantial, however, level of increased income (profitability) from improving BCS will vary depending upon several factors, most notably feed costs.

Table 5. Relationship of body condition score (BCS) to beef cow performance and income [a].

BCS[b]	Preg. Rate, % [c]	Calving Interval, days	Calf WA, days [d]	Calf DG, lb [e]	Calf WW, lb [f]	Calf Price $/100 lb [g]	Income $/Calf [h]	Yearly Income $/Cow [i]
3	43	414	190	1.60	374	123	460	182
4	61	381	223	1.75	460	116	534	300
5	86	364	240	1.85	514	109	560	443
6	93	364	240	1.85	514	109	560	479

[a] Adapted from Kunkle et al., 1998 UF/IFAS Publication SP-144
[b] Body Condition Score: scale of 1 (thin) to 9 (obese)
[c] Pregnancy rates averaged across trials in Texas, Oklahoma, and Florida when BCS was assessed at calving, breeding, and pregnancy testing.
[d] Weaning Age; 240 days for cows in BCS of 5 and 6 and decreases as calving intervals increase.
[e] Average Daily Gain
[f] Adjusted Weaning Weight; calculated as calf age times calf gain plus birth weight (70 lb).
[g] Average price for similar weight calves during December of 2007.
[h] Calculated as calf weight times calf price.
[i] Calculated as income/calf times pregnancy rate times 0.92 (% calves raised of those pregnant).

Summary

Optimal reproductive performance of your cow herd requires that cows be in a BCS of 5 or better at calving and through the breeding season. Economically, spending additional dollars during the winter to maintain cows in good body condition will result in increased value of your cow herd. However, given the shortage of forage and stored feed available this winter, maintaining cows in good body condition will be challenging. Suggested feeding strategies for producers with limited feed supplies are available under the publications link at: http://forageshotage.com

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