Managing and Feeding Beef Cows Using Body Condition Scores

Revised by Marcy Ward[1]

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INTRODUCTION

(Photo by Mary Ward.)

One of the greatest challenges facing cow-calf producers is maintaining a defined and short calving season. Maintaining a short calving season gives producers the ability to strategically manage their cow herd and to market uniformly aged calves at weaning. Strategic management includes a goal-oriented, low-cost nutrition program designed to meet the specific needs of all cows at the same time. With a short calving season, the cows are all in a similar production stage (lactation, gestation, etc.) at a given time during the production year. This makes developing a targeted nutrition program much easier and more efficient. Nutrient supplementation is typically the producer's largest variable cost and is highly influenced by the environment. During periods of drought or excessive snow cover, or when low-quality forage cannot meet nutritional needs, beef producers must intervene by providing additional feed, leasing extra pasture, or selling a portion of the cow herd to maintain balance with the range resource and meet production goals. Intervention of this nature is expensive and, therefore, must generate a positive return on the investment.

A cow's reproductive performance is closely associated with her body energy reserves. To help the beef industry communicate information relating animal performance to a cow's degree of body energy reserves, a numerical body condition scoring (BCS) system was developed. Understanding this scoring system gives producers a tool to develop and monitor their cow herd management program. This publication describes the BCS system, and the influence of energy reserves on reproductive performance, calf vigor, and health. Monitoring body condition of a cow herd can improve the efficiency of overall management strategies.

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THE BODY CONDITION SCORING SYSTEM

Body condition scores are numbers that indicate a cow's relative fatness, or body energy reserves. The system most commonly used for beef cows is a scale from 1 to 9, with 1 being severely emaciated and 9 extremely obese. Thus, a cow with a BCS of 5 is considered to be neither lean nor fat.

Body fat is the most visible indicator of body energy reserves, since excess energy is stored as fat. Therefore, many of the BCS system's points are based on the fat depth over certain areas of the cow's body. The degree of fat cover over bony structures is easily seen. However, differences in BCS among thin cows (BCS 1 to 4) primarily result from variations in energy stored in the muscles. The criteria used in the BCS system are described in Tables 1 and 2. Figure 1 illustrates key areas of the cow's body to evaluate when assigning BCS. Figure 2 depicts a cross-sectional view of a cow's back, showing the relationship of the spinous process, musculature, and fat cover. It is important to have a clear understanding of the cow's anatomy to accurately evaluate body condition.

Figures 3–9 show cows in BCS 2–8. The white-faced cow is shown in BCS 2, 3, 5, 6, and 7, while the solid red cow is shown in BCS 4–7. On average, a 1-point increment in BCS is equal to about 80 pounds of body weight. This varies somewhat based on the cow's frame size.

INFLUENCE OF ENERGY RESERVES ON REPRODUCTION

The relationship between reproductive success and body condition at calving is based on energy. Cows must have energy to support all bodily activities, but some functions have a higher priority for energy use than others. Table 3 shows the approximate "priority list" by which energy consumed by the cow is partitioned to different bodily functions.

From this table, it is apparent that energy required to initiate cycling after calving is only available if the cow's diet contains enough energy to exceed the requirements for priorities one through seven. A lactating cow's energy demand can be very high. It is important that the cow has adequate body condition at calving so that she has stored energy that can be used to meet her energy requirements. If she does not have enough stored energy at calving, she must gain weight during lactation so that she will have enough energy left over to begin cycling again. This can be difficult to achieve, especially with high milk-producing cows.

Body condition score at calving is typically the most important factor influencing the length of the postpartum anestrous period (time between calving and first heat) and pregnancy rate in beef cattle. Nutrient demand increases after calving due to the added energy and protein needs for lactation. As a result, body condition at calving decreases, which can increase the length of the postpartum anestrous period. Thus, the number of cows in heat early in the breeding season is reduced. Subsequently, calf age and weaning weights are also reduced.

Figures 10 and 11 show the relationship between BCS at calving and the length of the postpartum anestrous period. Clearly, fleshier cows have a better chance of becoming pregnant while still maintaining their calving interval. It may not be economical or desirable to keep cows in a BCS of 7 to 9. However, these findings illustrate the advantage heavier-conditioned females have to become pregnant and deliver a calf early the following calving season. A cow's gestation period averages 283 days; thus, the cow has 82 days to become pregnant and maintain a calving cycle of 365 days or less. Based on Figure 12, BCS 3 cows have little chance of maintaining a 365-day calving interval. BCS 4 cows averaged only one heat cycle to become pregnant and maintain a 365-day calving interval. Yet cows of BCS 5 or greater averaged two or more heat cycles to potentially conceive and still produce a calf on or before the same date the following year.

Calf health and vigor can also be influenced by a cow's body condition. Figure 13 shows the influence of BCS on colostrum quality. Colostrum is the first milk that contains important immunoglobulins designed to boost the immune system of a newborn calf. Calves that receive inadequate colostrum can be more vulnerable to sickness. Cows below BCS 4 produce less colostrum volume and total immunoglobulins.

Body condition at weaning is also related to reproductive performance. A nine-year summary of data from more than 77,000 cows (Table 4) clearly shows that cows that are thin at weaning are less likely to become pregnant during the following breeding season.

DEVELOPING A BODY CONDITION TARGET

Since body condition is associated with reproductive success, the BCS system can be used to set a predictable target. It is important to strive for a BCS at calving that will allow for cows to be reproductively efficient. This target BCS may not be the same for all operations, although scientific findings indicate that a

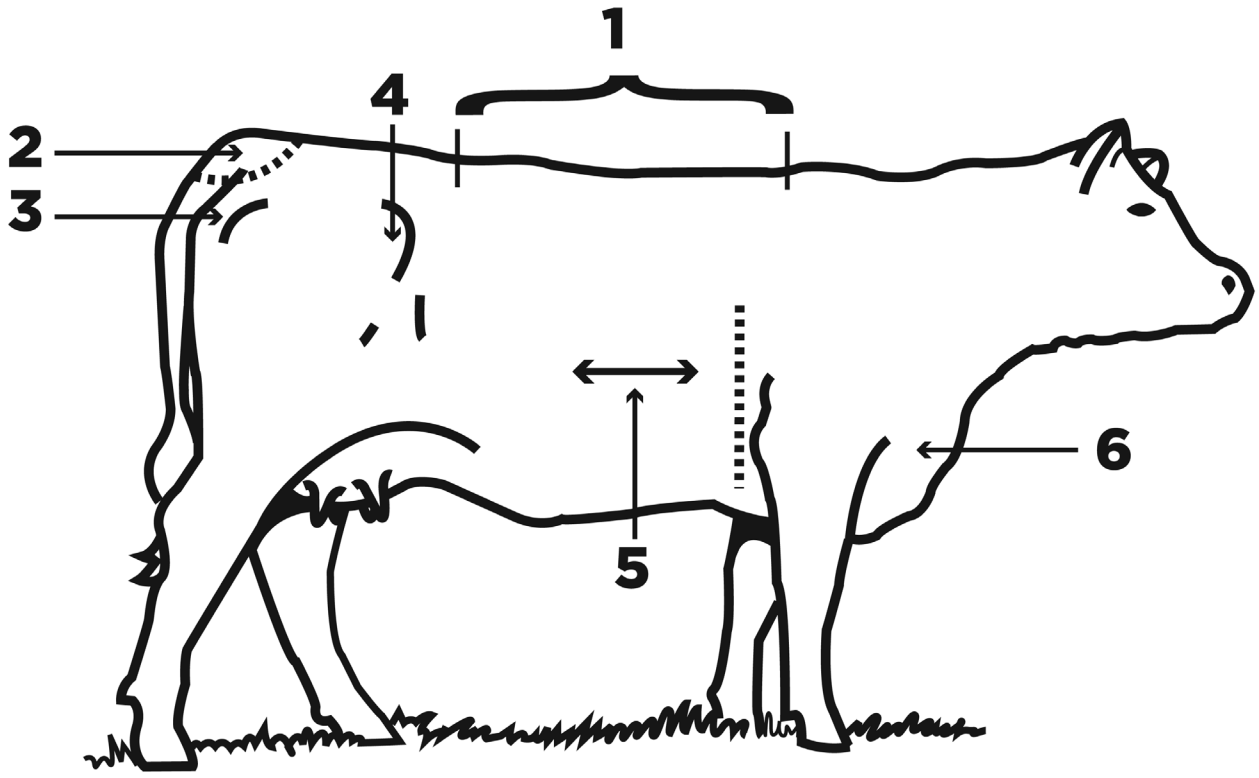

Figure 1. **Key points for body condition scoring: 1. back, 2. tail head, 3. pins, 4. hooks, 5. ribs, 6. brisket.**

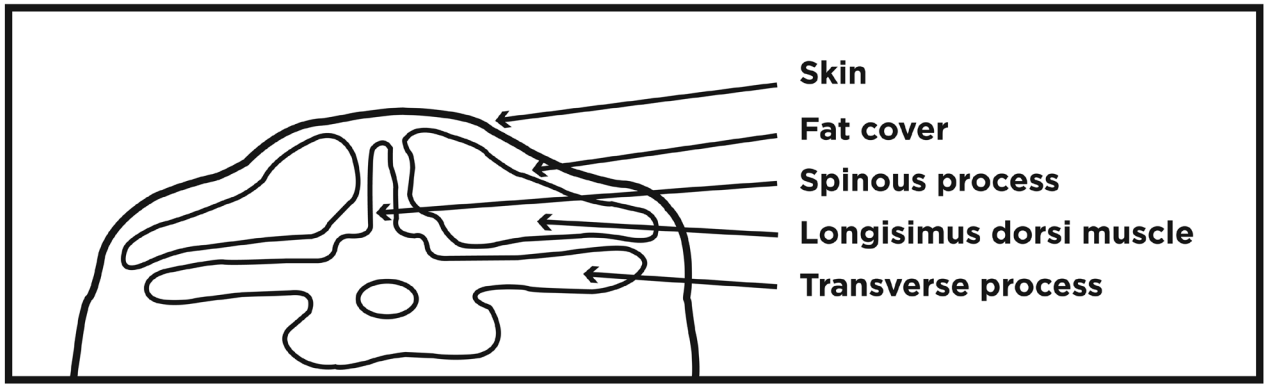

Figure 2. **Cross-sectional view of a cow's back.**

Figure 3. **BCS 2: Ribs and bone structure easily visible, but no signs of physical weakness.**

Figure 4. **BCS 3: Very thin. No visible fat is on the ribs or brisket. Individual muscles in the hindquarters are easily visible, and spinous processes are very apparent.**

Figure 5. **BCS 4: Thin. Ribs and pin bones are easily visible, and fat over the ribs is not apparent. Two to five ribs are visible. Individual muscles in the hindquarters are apparent.**

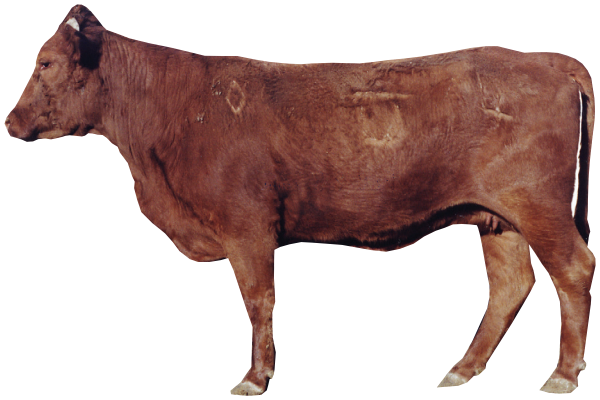

Figure 6. **BCS 5: Ribs are less apparent than in 4, and there is less than 0.2 inches of fat over the ribeye. Last one or two ribs may be apparent. No fat is present in the brisket. Individual muscles in the hindquarters are not apparent.**

Figure 7. **BCS 6: Appearance is smooth throughout. Some fat deposition is apparent in the brisket. Individual ribs are not visible.**

Figure 8. **BCS 7: Brisket is full. Tail head and pin bones have protruding deposits of fat on them. Back appears square due to fat. There is indentation over the spine due to fat on each side. Between 0.4 and 0.8 inches of fat covers the last two to three ribs.**

Figure 9. **BCS 8: Obese. Back is very square. Brisket is distended with fat. Large protruding deposits of fat on tail head and pin bones. Neck is thick. Between 1.2 and 1.8 inches of fat covers the last three ribs. Large indentation over the spine is present.**

Photos for Figures 3–9 by Clay Mathis.

Table 1. Description of the Body Condition Scoring System	
Score	**Description**
1	Severely emaciated. All ribs and bone structure easily visible. Physically weak; animal has difficulty standing or walking. No external fat present by sight or touch.
2	Emaciated. Similar to 1, but not weakened.
3	Very thin. No visible fat on the ribs or brisket. Individual muscles in the hindquarters are easily visible, and spinous processes are very apparent.
4	Thin. Ribs and pin bones are easily visible, and fat is not apparent by palpation of ribs or pin bones. Individual muscles in the hindquarters are apparent.
5	Ribs are less apparent than in 4, and there is less than 0.2 inches of fat over the ribeye. Last two or three ribs can be felt easily. No fat in the brisket. At least 0.4 inches of fat can be palpated over pin bones. Individual muscles in the hindquarters are not apparent.
6	Smooth appearance throughout. Some fat deposition in the brisket. Individual ribs are not visible. About 0.4 inches of fat on the pin bones and on the last two or three ribs.
7	Brisket is full. Tail head and pin bones have protruding fat deposits on them. Back appears square due to fat. Indentation over the spine due to fat on each side. Between 0.4 and 0.8 inches of fat on the last two to three ribs.
8	Obese. Back is very square. Brisket is distended with fat. Large protruding deposits of fat on tail head and pin bones. Neck is thick. Between 1.2 and 1.8 inches of fat on the last three ribs. Large indentation over the spine.
9	Very obese. Description similar to 8, but taken to a greater extreme.

Table 2. Key Points for Condition Scoring Beef Cows									
Reference point	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Physically weak[a]	Yes	No	No	No	No	No	No	No	No
Muscle atrophy	Yes	Yes	Slight	No	No	No	No	No	No
Outline of spine visible	Yes	Yes	Yes	Slight	No	No	No	No	No
Outline of ribs visible	All	All	All	3 to 5	1 to 2	0	0	0	0
Fat in brisket and flanks	No	No	No	No	No	Some	Full	Full	Extreme
Outline of hip and pin bones visible	Yes	Yes	Yes	Yes	Yes	Yes	Slight	No	No
Fat udder and patchy fat around tail head	No	No	No	No	No	No	No	Slight	Yes
Backfat estimate (inches)	0	0	0.05	0.11	0.19	0.29	0.41	0.54	0.68
[a]Muscles of loin, rump, and hindquarters are concave, indicating muscle tissue loss.									

Table 3. Priority of Energy Use by the Cow	
1	Basal metabolism
2	Grazing and other physical activities
3	Growth
4	Supporting basic energy reserves
5	Maintaining an existing pregnancy
6	Milk production
7	Adding to energy reserves
8	Estrous cycling and initiating pregnancy
9	Storing excess energy
Short et al., 1990	

Table 4. Relationship of Body Condition Score at Weaning and Pregnancy Rate					
	Body Condition Score				
	3 or less	4	5	6	7 or more
Number of cows	3,415	23,811	379,740	26,213	9,654
Percentage pregnant	75.5	85.4	93.8	95.6	95.6
Bowman and Sowell, 1998					

cow calving in BCS 5 is a low-risk target. However, it may be beneficial to target a slightly higher BCS of 5.5 to 6 for first-calf heifers to compensate for the larger energy demands of continued growth during her first lactation.

When determining a BCS target as a management goal, the concept of "risk and reward" must be considered. A supplementing strategy designed to achieve a BCS of 5 may be more expensive than one designed to achieve a BCS of 4 or 4.5. Cows in BCS 4 may have only one chance to become pregnant in time to maintain a 365-day calving interval, while those with BCS 5 may have two or more chances. If all cows conceived at first service, the thinner cows might be more economical. Research conducted in Nebraska indicated that while cows with a BCS of 5 or greater had the highest pregnancy rates, cows with a BCS between 4 and 5—specifically an average of BCS 4.3—achieved the highest net returns (Ferrell and Jenkins, 1996). This was due in part to the reduced amount of feed required to maintain the cows in lesser body conditions. However, since a cow with a marginal BCS of 4.5 or less does not have far to fall to be highly unproductive, additional body condition can be considered as insurance. Individual managers must evaluate their tolerance for risk in making this decision.

GROUPING THE COW HERD USING BODY CONDITION SCORES

One of the keys to using BCS to manage reproductive performance successfully is having the capability to sort and supplement cows relative to a target BCS. For example, cows could be sorted into two groups: those at or above the target BCS that need no special management, and those below the target that need additional nutrients to improve their chances of becoming pregnant early in the breeding season. Thinner cows and heifers could be pastured together because heifers should be fed for optimal growth and thin cows need additional supplementation to achieve appropriate gain. Further sorting of cows that are below the targeted BCS into two or more groups may also improve the precision of the nutrition program. The degree of sorting depends on the availability of facilities and pastures to accommodate the different cow groups.

Grouping cattle according to BCS allows producers to manage the nutrition program strategically, targeting nutrients to cows that are least likely to become pregnant early in the breeding season (below target BCS). The objective is to group the thin cattle together and provide supplemental feed (grazed or fed) sufficient to meet production goals, without pouring unneeded feed and dollars into cows that are already in acceptable condition.

TIMING OF SUPPLEMENTATION

Under most New Mexico range conditions, a nonlactating cow that consumes only dormant forage plus protein supplement will lose 40 to 80 pounds (0.5 to 1 BCS) during the winter grazing season. Also, a cow's energy needs continue to increase as she approaches calving. Therefore, typically the most economical time to add body condition is immediately following weaning, when her energy demands are at their lowest.

A cow's energy requirements are the lowest directly after weaning because she is no longer lactating and requirements for fetal development are still relatively low. Additionally, as a cow "dries up" because her calf is no longer nursing, she maintains some advantage in the efficiency of converting feed into

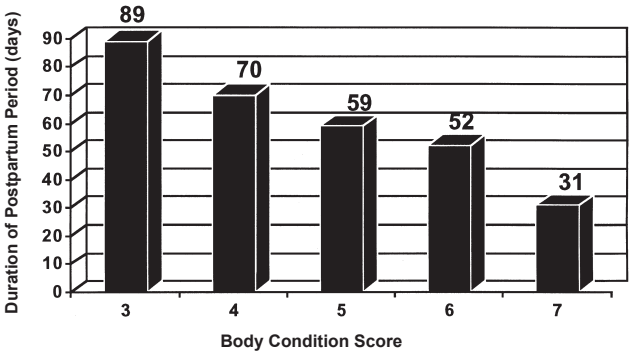

Figure 10. **Effects of body condition at calving on postpartum duration. (Adapted from Houghton, 1990.)**

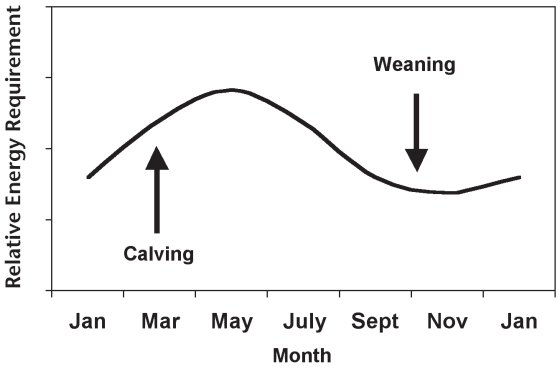

Figure 12. **Relative energy requirements of a spring-calving beef cow.**

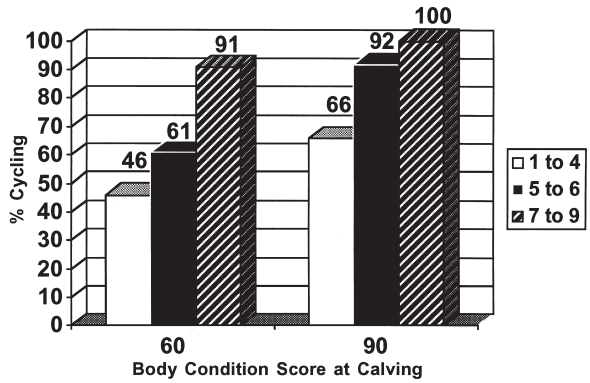

Figure 11. **Effects of body condition score at calving on percentage of cows cycling by 60 and 90 days postpartum. (Adapted from Whitman, 1975.)**

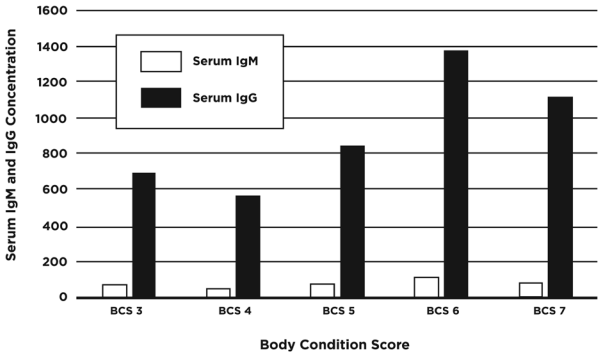

Figure 13. **Effect of cow BCS on serum calf immunoglobulin levels (Odde et al., 1988).**

energy reserves. This small window of opportunity is generally the most economical physiological stage for increasing body energy reserves.

The efficiency of gain usually is lower 60 days prior to calving. It should be noted that it takes approximately 40 to 55 days to increase BCS by 1 unit, when cows are gaining 1.5 to 2.0 pounds of nonfetal weight per day. Large gains in BCS may not be feasible at this time. Choosing to delay supplementation can allow producers to maintain some flexibility and to take advantage of any favorable environmental conditions. However, it may carry slightly more risk than sorting at weaning in the fall and ensuring that cows are in acceptable body condition prior to the winter grazing season.

Table 5 shows that providing a higher energy level before calving can impact the length of the postpartum anestrous period and potential age and weight of the following calf crop at weaning. However, it is important to note that both precalving nutrition levels yielded a postpartum anestrous period of less than 82 days. Cows fed the higher energy level before calving had two chances to become pregnant and maintain a 365-day calving interval, whereas cows in the low energy group only had one chance. As with any input, the relationship of cost to return should be evaluated. An effort to maintain a high energy level for an extended period of time before calving should be limited to cows that are exceptionally thin and at high risk of calving too late or being open at the end of the breeding season.

In general, it is better for a thin cow to gain weight after calving than for a well-conditioned cow to lose large amounts of weight between calving and breeding (Table 6). Nevertheless, it still is more desirable for all cows to be in the targeted BCS range at calving than to sort off and feed thin cows extra, while they are nursing calves.

Table 5. Influence of High- and Low-energy Diets Fed for 90 Days Precalving on Length of the Postpartum Anestrous Period in Beef Cows

Precalving Diet	Postpartum Anestrous Duration
High[a]	51 days
Low[b]	67 days

[a]High = 14.1 pounds of total digestible nutrients/day
[b]Low = 7.1 pounds of total digestible nutrients/day

Adapted from Bellows and Short, 1978.

Table 6. Influence of Postcalving Body Condition Gain on Pregnancy Rate

BCS Prior to Calving	BCS 90 Days after Calving	Level of Postcalving Energy Intake	Pregnancy Rate (%)
6.5	5.1	Low[a]	77
4.4	5.2	High[b]	95

[a]High = 16 pounds of total digestible nutrients/day
[b]Low = 8 pounds of total digestible nutrients/day

Adapted from Wiltbank et al, 1962.

Table 7. Supplementation Needs and Estimated Cost for Increasing Body Condition Post Weaning

Item	BCS 3	BCS 4	BCS 5	BCS 6
Cow body weight (lb)	950	1,025	1,100	1,175
Gain needed (lb/d)	3.5	1.5	0.9	0
Nutrient Requirements[a]				
Crude protein (lb)	2.0	1.9	1.8	1.7
TDN energy (lb)	14.5	13.2	12.0	11.0
Forage/Supplement Intake (lb/day)				
Forage	16	19	22	26
Supplement	6.0	4.75	3.2	2.0
Supplement Cost per Cow[b]				
120-day total	$180.00	$142.50	$96.00	$60.00

[a]Based on nutrition requirements of a 1050 lbs cow; NASEM, 2016.
[b]Supplement cost based on 3 lbs per day feeding rates.

FEEDING TO INCREASE BCS

Developing a cost-effective feeding program depends greatly on local hay prices and/or the availability and price of other industries' products and byproducts that can be used as inexpensive energy sources. Nonetheless, feeding thin cows to increase their body condition does not have to be a complicated task. Table 7 provides a nutrition and cost scenario to increase body condition in cows post weaning. This feeding scenario is based on supplementing from weaning to calving (approximately 120 days).

It may be practical to group thin cows after weaning and graze them in the best-quality pasture saved for this purpose. In less extensive cattle operations, it has been successful to move cows to new pastures when they calve. However, in a relatively dry climate where forage supply often is limited, this technique caters to early calving females that have the greatest opportunity to select a high-quality diet because they graze the new pasture first. Subsequently, the later-calving females receive less benefit.

In general, it takes three to four weeks to increase a non-lactating thin cow by 1 BCS when the cow is fed all the medium-quality hay she can eat (25–35 pounds of hay/day) in a small trap or drylot. Hay is not the only feedstuff that can produce the necessary weight gains, but it generally is one of the more readily available commodities. Byproduct feeds can be fed in the same manner as long as the diet is balanced and does not cause digestive upset. When available, grazing harvested corn and grain sorghum fields may also work well at a relatively low cost. When comparing potential energy sources, it is important to price byproducts according to the energy they will provide to the cow ($/pound of total digestible nutrients [TDN]).

CONCLUSIONS

The BCS system was created to help the cattle industry relate beef cow energy reserves to performance. Producers can use the system to identify critical energy reserve levels, primarily related to reproductive performance. Body condition at calving generally is the best indicator of the potential length of the postpartum anestrous period. A conservative target for cows at calving is BCS 5. However, every beef operation is different, and producers using BCS as a tool should set BCS targets based on their willingness to assume risk. It is probably most effective to sort out thin cows at weaning and provide them with additional energy directly after weaning when their requirements are low. An option would be to group thin cows (BCS <4) and first calf heifers at this time to achieve the desired BCS of 5 and 6, respectively, by calving.

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