Body Condition Scoring as a Tool for Dairy Herd Management

Body condition scoring evaluates fatness or thinness according to a five-point scale and scores are used to fine-tune dairy nutrition and health.

Introduction

Body condition influences productivity, reproduction, health, and longevity of dairy cattle. Thinness or fatness can be a clue to underlying nutritional deficiencies, health problems, or improper herd management. If done on a regular basis, body condition scoring can be used to troubleshoot problems and improve the health, longevity, and productivity of the dairy herd.

Overconditioning, or fatness, may result from poor nutrition or reproduction management. A fat cow is more susceptible to metabolic problems and infections, and is more likely to have difficulty at and after calving. Overconditioning usually begins during the last three to four months of lactation, when milk production has decreased, but dietary energy and total nutrient levels have not been reduced accordingly. Other common causes of overconditioning are prolonged dry periods or overfeeding during the dry period.

Underconditioning, or thinness, can frequently lower production and milkfat levels because of insufficient energy and protein reserves to maintain production. Thin cows often do not show heat or conceive until they start to regain—or at least maintain--body weight. In feeding these animals, care must be taken to maintain production while increasing body reserves.

Body condition scoring is also useful in dairy heifer feeding management. Thin heifers may not grow rapidly enough to reach puberty by 11 to 13 months of age. They may also be too small to calve at 22 to 24 months or to carry enough weight to maintain a normal first lactation production. On the other hand, fat heifers have been shown to be difficult to breed, and if fat when they are near calving, have difficult calving and produce less milk when they enter the milking herd, especially if they have been fat at puberty.

Body Condition Scoring Scale

Body condition scoring in dairy cattle is a visual and tactile evaluation of body fat reserves using a 5-point scale with 0.25-point increments. Body condition scores (BCS) are an indirect estimate of energy balance. A score of 1 denotes a very thin cow, while 5 denotes an excessively fat cow, and 3 is an average body condition. Evaluation focuses on the rump and loin; landmarks used in assigning BCS are shown in Figure 1. We have developed a video that presents a step-by-step process for assigning BCS using a method that produces accurate, consistent scores. Assessments of the same animal by different people should be within 0.25 points. Additional examples and descriptions of BCS across the range of the scale are presented in the BCS image gallery.
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Related Research

Research demonstrates the classical relationship of body condition to dry matter intake, milk production, reproduction, and health. Figure 2 shows the relationships between body condition and the production cycle of dairy cows.

Dry Matter Intake

Body condition score generally is negatively related to dry matter intake. This means that cows carrying excess condition before calving have a greater risk for low feed intake in the critical transition period around the time of calving. This can lead to loss of body condition and deepen the negative energy balance cows experience after calving. Reduced dry matter intake has obvious effects on milk production and can contribute to ketosis, a displaced abomasum, or other metabolic and production consequences of nutritional stress.

Milk Production

Mobilization of stored body fat provides a source of long-chain fatty acids for milk fat production and an energy source for body tissues in early lactation. Often BCS and milk production curves are mirror images, with cows producing the most milk experiencing the greatest change in body condition and the lowest BCS in early lactation. However, the effect of BCS on milk production is not a linear relationship. Cows with a BCS of 3.0 to 3.5 at calving produce more milk than those calving either at a lower or higher score. This relationship may be due to an increase in the energy available from body stores up to a BCS of 3.5 and negative effects of BCS on dry matter intake after that point. Cows can typically be expected to lose some condition score in the first 60 days after calving. We now generally recommend that cows loose as little BCS as possible after calving; no more than 0.5 to 1.0 point in score, with a maximum of 1.5 units of condition score. The 2001 Nutrient Requirements of Dairy Cattle include calculations that describe how much milk production can be supported by the mobilization of stored body fat. For example, if a cow weighing 1433 pounds with a BCS of 4.0 at calving loses 1 BCS unit, 417 Mcal of NE\textsubscript{L} are produced. This is enough energy to support 1,230 pounds of 4\% fat-corrected milk production.

Reproduction

Energy balance plays a very important role in reproductive performance, and both current and past energy status influence a cow’s ability to reproduce. Greater change in BCS between calving and first breeding and lower BCS at the first breeding consistently are associated with reduced pregnancy rates. However, multiple studies have found that diet changes were not able to overcome BCS loss in early lactation, which means that the primary way to control BCS at breeding is to manage BCS at calving.

A Cornell study published in 1989 provides a good example of the impact of BCS on reproduction. In the study three groups of dry cows were monitored to determine the effect of body condition during the dry period on subsequent reproductive performance. Cows with the highest BCS at calving lost the most body condition in the first 5 weeks of lactation. These cows had a longer interval to first ovulation, a higher number of days to first heat and conception, and the lowest first-service conception rates (Table 1). Losing body condition during early gestation has also been associated with increased embryonic losses. For the farmer, these factors mean lost dollars.
Table 1. Relationship between BCS loss in first 5 weeks after calving and reproduction.

<table>
<thead>
<tr>
<th>Item</th>
<th>Body Condition Loss &lt; 0.5</th>
<th>Body Condition Loss 0.5 to 1.0</th>
<th>Body Condition Loss &gt; 1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means in a row with different superscripts differ $P &lt; 0.05$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Cows</td>
<td>17</td>
<td>64</td>
<td>12</td>
</tr>
<tr>
<td>BCS at Calving</td>
<td>3.7</td>
<td>4.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Days to first ovulation</td>
<td>27 a</td>
<td>31 a</td>
<td>42 b</td>
</tr>
<tr>
<td>Days to first heat</td>
<td>48 ab</td>
<td>41 a</td>
<td>62 b</td>
</tr>
<tr>
<td>Days to first service</td>
<td>68 a</td>
<td>67 a</td>
<td>79 b</td>
</tr>
<tr>
<td>First service conception rate, %</td>
<td>65 a</td>
<td>53 a</td>
<td>17 b</td>
</tr>
<tr>
<td>Services per conception</td>
<td>1.8</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Pregnancy rate, %</td>
<td>94</td>
<td>95</td>
<td>100</td>
</tr>
</tbody>
</table>

Health

Body condition at calving and in early lactation is associated with the incidence of important metabolic disorders in dairy cows, particularly ketosis. The risk of ketosis has been shown to be two times greater for cows calving at BCS > 3.5 compared to those calving at BCS 3.25, and the rate of both clinical and subclinical ketosis is greater in cows with high BCS. Milk fever may also be related to BCS. One study found cows with BCS < 2.5 or > 3.5 were 13% or 30% respectively more likely to suffer milk fever than cows with BCS of 3.0. Fat cows mobilize more energy from body reserves, which tends to reduce dry matter intake and increase milk production; both factors contribute to metabolic disease risk.

Often, studies investigating the relationship between BCS and health problems have reported inconsistent results. Metritis risk tends to be increased in cows with low BCS or those that lose body condition during the dry period. Cows losing condition during the dry period may have increased risk of dystocia, and a New Zealand study of nearly 77,000 BCS records from 1,172 cows found that the amount of body weight lost between calving and conception affected the proportion of cows that gave birth to male calves, which could increase the risk of dystocia due to size differences between male and female calves. Cows with high BCS at calving or excessive loss of condition in early lactation have been shown to be more likely to experience a displaced abomasum. Retained placenta has been found to be more common in cows with excess body condition. More recent research has determined that cows with BCS greater than 3.5 are more sensitive to oxidative stress and more likely to have suppressed immune function, which likely contributes to increased disease risk in these cows. Lameness has been associated with both fat and thin cows. In cows that are overconditioned at dry-off, lameness may arise due to stress from carrying extra weight or from reduced dry matter intake at calving that leads to excessive BCS loss as lactation progresses. Cows with BCS < 2.0 are more likely to suffer from lameness, which is possibly due to a thinner digital cushion that leads to greater incidence of sole ulcers and white line disease.

Target Scores for Stages of Lactation

Changes in body condition are to be expected as a cow moves through the stages of lactation and gestation (Table 2). For most cows, BCS decreases from calving to about 100 days in milk and then increases through dry-off. A few efficient, high-producing cows may not experience large changes in BCS, and some inefficient, low producing cows may continually increase in BCS over a lactation. However, when cows accumulate too much or too little condition or changes occur too rapidly, health and performance can be affected. Generally speaking, the goal is to manage body condition such that the extremes of over- or underconditioning are avoided. Nutritional strategies to manage body condition change as cows progress through lactation.

<table>
<thead>
<tr>
<th>Stage of Lactation</th>
<th>DIM</th>
<th>BCS Goal</th>
<th>BCS Min</th>
<th>BCS Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving</td>
<td>0</td>
<td>3.50</td>
<td>3.25</td>
<td>3.75</td>
</tr>
<tr>
<td>Early Lactation</td>
<td>1 to 30</td>
<td>3.00</td>
<td>2.75</td>
<td>3.25</td>
</tr>
<tr>
<td>Peak Milk</td>
<td>31 to 100</td>
<td>2.75</td>
<td>2.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Mid Lactation</td>
<td>101 to 200</td>
<td>3.00</td>
<td>2.75</td>
<td>3.25</td>
</tr>
<tr>
<td>Late Lactation</td>
<td>201 to 300</td>
<td>3.25</td>
<td>3.00</td>
<td>3.75</td>
</tr>
<tr>
<td>Dry Off</td>
<td>&gt; 300</td>
<td>3.50</td>
<td>3.25</td>
<td>3.75</td>
</tr>
<tr>
<td>Dry</td>
<td>- 60 to -1</td>
<td>3.50</td>
<td>3.25</td>
<td>3.75</td>
</tr>
</tbody>
</table>

Table 2. Suggested Body Condition Scores for Cows by Stage of Lactation.
Calving to Peak Milk
Cows should calve with adequate, but not excessive, body fat reserves and a BCS between 3.25 and 3.75. Dry matter intake should be managed closely for close-up and fresh cows to limit negative energy balance in early lactation. The early lactation ration must encourage maximum intakes and provide adequate energy and protein levels to support peak milk production and encourage a return to normal reproductive cycles. Cows in early lactation enter a negative energy balance and mobilize body fat to support milk production. The amount of energy a cow can draw from her body reserves depends on her weight and body composition. High-producing cows can lose 100 to 150 pounds of body weight during the first 60 to 80 days of lactation. This is typically the equivalent of 1 BCS unit and occurs at a rate of 1 to 2 pounds per day. If weight loss is higher (3 to 4 pounds per day), the risk of metabolic disorders and reduced fertility becomes higher. Mobilized body tissue can often support 1,000 to 1,300 pounds of 4% fat-corrected milk production. The goal is to minimize weight loss by encouraging intake of high quality, highly palatable forage dry matter at a rate of 1.8 to 2.0% of body weight per day, with grain supplemented to support milk production.

Early lactation cows that are thin but not high producers are not getting enough energy. Be sure that all nutrients are balanced properly and that dry matter and water intakes are adequate. Cows in early lactation with BCS > 3.25 and lower milk production than expected are likely not getting enough protein. In addition, confirm that mineral, vitamin, and water intakes are adequate.

Mid-Lactation
After cows reach their peak milk production they should start replenishing body fat reserves, and it becomes more efficient to add body condition. If regaining body condition is delayed past 80 to 120 days, cows will often have reduced fertility. The nutritional program should encourage moderate weight gain (0.75 to 1 pound per day) that will support milk production and fertility, but avoid excessive weight gain. If cows have BCS > 3.25, energy intake should be reduced to avoid overconditioning.

Late Lactation
Late lactation is the optimum time to manipulate body condition. Cows should be in a positive energy balance and confirmed pregnant by this time, and changes in body condition can be made very efficiently. If cows have BCS < 3.0, increase energy intakes. Failure to replenish energy reserves will limit milk production during the next lactation. If BCS exceeds 3.75, energy intakes are too high and should be reduced to avoid excessive fattening. Extended calving intervals may also contribute to high BCS in late lactation.

Dry Period
The goal of the dry period is to prepare cows for their next lactation by maintaining body condition. Separate dry cows from the milking herd and feed them a low energy ration with adequate, but not excessive, protein, minerals, and vitamins. If cows are too fat at dry-off (BCS > 3.75) it is best to keep them from losing BCS during the dry period. Thin cows (BCS < 3.0) may benefit from extra energy in the first three weeks of the dry period.

If cows consistently enter the dry period with BCS < 3.25, energy intake should be increased for cows in late lactation. If cows are consistently at BCS > 3.75 at dry-off, reduce the energy intake late lactation cows and/or address issues contributing to extended calving intervals.

To keep dry cows in proper condition, ensure that forage dry matter intake is a minimum of 1.8 to 2.0% of body weight per day. Forage should provide 85 to 88% of the total ration dry matter. If necessary, control feed intake to hold dry matter intake to 2% of body weight.

Heifers
Table 3 presents recommended BCS for heifers throughout the rearing period. Feed balanced rations that provide adequate levels of all nutrients so that heifers can grow properly and maintain BCS in a normal range. If young heifers are allowed to become too thin, they will not grow at the proper rate and may have reproductive problems that delay their first calving. Failure to provide adequate feed to older heifers may limit their ability to support milk production. On the other hand, overconditioning of bred heifers can increase calving difficulty and have negative repercussions on the health of both the heifer and her calf. Overfeeding younger heifers, particularly between weaning and puberty, leads to greater fat infiltration of the mammary gland and increased breeding difficulty. When these heifers freshen, they will not produce to their full genetic potential.

<table>
<thead>
<tr>
<th>Events</th>
<th>Age (months)</th>
<th>BCS Goal</th>
<th>BCS Min</th>
<th>BCS Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Breeding</td>
<td>10 to 12</td>
<td>2.75</td>
<td>2.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Breeding</td>
<td>12 to 15</td>
<td>3.00</td>
<td>2.50</td>
<td>3.25</td>
</tr>
<tr>
<td>Bred</td>
<td>15 to 20</td>
<td>3.25</td>
<td>3.00</td>
<td>3.50</td>
</tr>
<tr>
<td>Calving</td>
<td>&gt; 20</td>
<td>3.50</td>
<td>3.50</td>
<td>3.75</td>
</tr>
</tbody>
</table>

Table 3. Suggested Body Condition Scores for Growing Heifers by Age in Months.
Troubleshooting

Regular monitoring of BCS can be useful in tracking changes over the lactation and in troubleshooting nutrition and health problems in the herd. We have developed a simple spreadsheet that may be used in tracking BCS over time and comparing cows or heifers to recommended BCS.

Within a herd, we can expect a few cows, about 5 to 10% at most, that either never put on much flesh or usually tend to be obese. Signals that body condition is not where it should be may include an increase of 5 to 10% in the incidence of metabolic diseases or a failure of cows to maintain lactation persistency or peak at expected levels. When animals are not in proper condition, the first thing to check is the feeding program. Focus first on dry matter intake, especially of forage. Forage should account for at least 45% of a cow's total dry matter intake. Determine that the feeding sequence, fiber levels, feeding frequency, and ration palatability are in order.

If these items are adequate, evaluate protein, energy, mineral, and vitamin levels in rations to be sure they are adequate. Test forages and re-balancing rations for each group of cows as needed. Be sure to analyze for bound protein in hay-crop silages and adjust the ration accordingly. Examine feed quality, including particle size of forage and grain, and smell and pH of silages and wet commodity feeds.

Check rations for amounts of bypass and soluble protein and for levels of starch, fats, and oils. Feed extra energy in early lactation to offset negative energy balance. Added fat from oilseeds should comprise no more than 5% of total ration dry matter. Rumen-protected (bypass) fats can provide an additional 2% of ration dry matter. Total fat in the ration should not exceed 7%. When oils and fats are added to the ration, increase calcium, magnesium, and phosphorus by 10% on a dry matter basis.

Once the cause of the problem has been determined, the next step is to keep it from reoccurring. Avoid rapid fluctuations in body condition. Pay close attention to cows during lactation, especially the later part, and during the dry period. When large amounts of forage are consumed or if grain is not fed properly, animals may become overconditioned and are more susceptible to health problems. In dry cow rations these factors are more often overlooked.

Summary

Research demonstrates that a cow's body condition relates to her overall performance and that body condition scoring can be an important tool in dairy herd management. In scoring a cow, the tail head and loin are the major areas to evaluate. Target scores help determine what condition to aim for during the different stages of lactation. If done on a regular basis, body condition scoring can improve dairy herd nutrition, health, and production. Proper conditioning, then, can be accomplished by body condition scoring, paying close attention to the animals, and ensuring that their nutrient requirements are being met, but not exceeded.

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