DairyNZ body condition scoring

The reference guide for New Zealand dairy farmers
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Preface

As a companion to the DairyNZ Body Condition Scoring Made Easy field guide, this resource aims to provide farmers with advice on body condition score (BCS) targets, the effect of management strategies on BCS and a comprehensive “how to” guide on getting accurate results whenever herds are scored.

This reference guide is a summary from an invited scientific review on the effect of BCS on key productivity-related traits and animal welfare, and the relationship between farm management, cow genetics and nutrition on BCS change. The review was compiled by an international team led by DairyNZ scientists. It has been published in *Journal of Dairy Science* (J. Dairy Sci. 92:5769–5801) and can be accessed, in full, on [journalofdairyscience.org](http://journalofdairyscience.org).

The scientific review and this resource have been made possible through the generous support of DairyNZ and the New Zealand Ministry of Agriculture and Forestry’s, Sustainable Farming Fund.
Introduction

A cow’s body condition score (BCS) provides a reasonably accurate measure of her energy reserves, and BCS targets at key stages of lactation have been identified to optimise dairy production systems. These targets are based on research studies undertaken in New Zealand and internationally over the last 30 years. These studies were summarised in a scientific review published in *Journal of Dairy Science* that DairyNZ scientists were invited to lead. The contents of this review confirmed and quantified the recognised effects of BCS on dry matter intake, milk production, reproduction, and cow health and welfare. In addition, there was evidence that BCS in early lactation can affect the sex of future calves and the productive and reproductive capacity of heifers yet to be born.

Irrespective of the system of farming (low or high input), cow genetics, or the country where the research was undertaken, productivity was optimised when mature cows calved between BCS 5.0 and 6.0 and when first and second calvers were 0.5 BCS units fatter than mature cows. That said, the productivity benefit declined with increasing BCS and the risk of metabolic health disorders at calving was greater, such that increasing BCS beyond 5.0 in mature cows and 5.5 in first and second calvers cannot be justified economically or from an animal welfare perspective. It is important to realise that the recommended calving BCS targets are a compromise between wanting cows with sufficient energy reserves for milk production, while not being so fat as to compromise cow health.

To ensure calving BCS targets are achieved, BCS targets for mid and late lactation have also been defined. These targets and the most appropriate management to achieve these targets are explored in this resource.

Although target BCS recommendations tend to be herd-focussed, the review also highlighted the need to consider individual cow BCS. Animal welfare is concerned with the state of the individual cow and not the average of the herd as a whole. Achieving the desired herd average target may still leave a significant proportion of cows that are too thin and too fat. The agreed *Dairy Cattle Code of Welfare 2010* (New Zealand Ministry of Agriculture and Forestry) stipulates that if individual cows are less than BCS 3.0, they must be managed to increase their BCS.

Contrary to popular belief, farm management and nutrition in very early lactation (first four to five weeks after calving) has little impact on the speed at which a cow loses BCS or the amount of BCS lost. However, mid and late lactation management and nutrition, and nutrition when the cow is dry, influence how fast a cow gains (or loses) BCS. Management strategies that facilitate achieving BCS targets are presented in this resource.

This resource should be used as a companion to the DairyNZ *Body Condition Scoring Made Easy* field guide. It provides the justification for the targets and management strategies to help achieve the targets.
Section 1
Assessing BCS
Assessing BCS using the DairyNZ method

Key points

- Body condition score (BCS) is a subjective assessment of a cow’s energy reserves. However, the BCS systems in place can accurately categorise the “fatness” of a cow if the assessor is well trained and experienced.

- Body condition scoring is a simple process that rates the “fatness” of a cow on a scale of 1 to 10, where 1 is emaciated and 10 is obese. It is important to calibrate the eye by first condition scoring cows “hands on” at the dairy or in a vet/AB race before assessing cow BCS in the paddock.
  - Line up 15 cows with a range of BCS.
  - Put your hands on the important body points (outlined below) as cows tend to vary in shape and where they store fat. Assessing all of these points allows an assessor to be consistent across breeds and cow ages.
  - Feel the amount of fat cover over the recommended body points and the differences between the cows.
  - Allocate a score to each of the eight body parts and average the different areas to come up with the BCS for that cow.

- Having calibrated your eye, assess BCS of at least 70 randomly selected cows in each herd to get a good indication of the average (and range) BCS of the herd.

- Body condition scoring is easy but requires practice.

Important body points to consider when condition scoring cows:
Table 1. Quick guide to body condition scoring

<table>
<thead>
<tr>
<th>Body part</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone</td>
<td>Is it flat or is there a ridge? Can you see or easily feel notches?</td>
</tr>
<tr>
<td>Long ribs</td>
<td>Can you see or easily feel the ribs? If visible, how many can you see?</td>
</tr>
<tr>
<td>Short ribs</td>
<td>Can you see the short ribs? What do they feel like? Are the rib ends sharp or rounded?</td>
</tr>
<tr>
<td>Hip bones</td>
<td>Are the hip bones rounded or angular?</td>
</tr>
<tr>
<td>Rump</td>
<td>Is the area between the pins and hip bones, flat, sunken or hollow?</td>
</tr>
<tr>
<td>Pin bones</td>
<td>Are they pointed, tap-like or rounded?</td>
</tr>
<tr>
<td>Tailhead</td>
<td>Is there a hollow between the tail head and pin bones? Is it a deep V or shallow U shape?</td>
</tr>
<tr>
<td>Thigh</td>
<td>Is the area indented, flat or rounded? Is the muscle structure defined?</td>
</tr>
</tbody>
</table>

Why use the DairyNZ BCS method?

There are a number of different methods recommended for assessing BCS with varying degrees of accuracy/consistency. The method developed and supported by DairyNZ is regarded as the standard for the following reasons:

1. Introduced and developed over 30 years ago, the method is internationally recognised and forms the basis of the milk production, reproduction and animal health publications quantifying the effect of BCS on productivity and sustainability for New Zealand dairy systems

2. The standard is recognised and recommended by the Ministry of Agriculture and Forestry and embedded as Appendix I in the Dairy Cattle Code of Welfare 2010

3. Dairy cattle in New Zealand vary considerably in size and frame compared with dairy cows in other parts of the world. It is also evident that there is variation in the way in which New Zealand dairy cows store fat reserves across their bodies. The method outlined in the DairyNZ Body Condition Scoring Made Easy field guide has been designed to take into account this variation, by assessing fat reserves at multiple points across the frame of the animal to correctly assess overall BCS

4. Once mastered, the method is fast and accurate

5. The method is supported by additional BCS resources, such as those available on dairynz.co.nz/bcs
**BCS versus live-weight**

Live-weight (Lwt) change is not a good indicator of BCS change. This is why BCS systems were developed globally. Factors such as breed differences, cow to cow variation in size within a breed, change in gut fill, pregnancy and heifer and second calver growth prevent the use of Lwt as an accurate measure of an individual cow’s energy reserves. New Zealand research results indicate that Lwt change only explains 25% of the variation in BCS change. Despite its limitations, many farmers measure Lwt as an indication of how much BCS a cow has gained or lost. As a guide, the average amount of weight gain/loss for every unit of BCS change is equivalent to 6.58% of a cow’s total Lwt.

**Average Lwt change per BCS unit for common breeds are as follows:**

- **Jersey (425 kg Lwt)** 1 unit change in BCS = 28 kg
- **Crossbred (475 kg Lwt)** 1 unit change in BCS = 31 kg
- **NZ Holstein-Friesian (500 kg Lwt)** 1 unit change in BCS = 33 kg
- **Overseas Holstein-Friesian (550 kg Lwt)** 1 unit change in BCS = 36 kg

Even with training and experience, an assessor can only score cows to a 0.5 BCS unit visually with confidence. Very experienced assessors can score cows to 0.25 BCS units if they are able to feel the main body parts. This cannot be done accurately and consistently by sight. Remember 0.25 BCS units is only 6-8 kg Lwt.
Breed variation and BCS

Although there are significant differences in size and angularity between the common New Zealand dairy breeds, the same guidelines for BCS assessment can be applied to all breeds.

Jerseys are typically smaller framed, with a comparatively narrow body and prominent hip bones.

Crossbreds and New Zealand-type Holstein-Friesians are classified as medium framed animals that carry fat reserves evenly over the body.

New Zealand-type Holstein-Friesians are generally, shorter, rounder and blockier than the larger overseas Holstein-Friesian type.

Overseas Holstein-Friesians are more angular, appear thinner and tend to carry more body fat over the long ribs and less around the tail head than New Zealand-type Holstein-Friesians.
“Hands on” condition scoring

Backbone

When assessing the backbone, look at the ridge formed by the spine above the short ribs (loin).
From the rear of the animal, is the backbone ridged and prominent or rounded and flat?
From the side of the animal, are notches formed by the individual vertebrae visible or is the ridge of the back smooth?

<table>
<thead>
<tr>
<th>BCS 3.0</th>
<th>BCS 4.0</th>
<th>BCS 5.0</th>
<th>BCS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>

If no notches are visible then BCS is greater than 4.0. If notches are visible then BCS is 4.0 or less.

Long ribs

As BCS falls, long ribs gradually become more apparent. The last rib closest to the tail is the first to be seen and then more ribs appear toward the head as BCS falls (this area in particular can be influenced by shadow, cow colour and whether the cow is wet or dry).
Can the ribs be easily seen and, if so, how many? If the long ribs cannot be seen from a distance can they be felt?

<table>
<thead>
<tr>
<th>BCS 3.0</th>
<th>BCS 4.0</th>
<th>BCS 5.0</th>
<th>BCS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
</tr>
</tbody>
</table>

If long ribs are not visible, BCS is 5.0 or more.
If long ribs are visible down to the level of the udder then the cows is below BCS 3.0 and urgent remedial action must be taken.
**Short ribs**

The “short ribs” of a cow are actually not ribs at all; they are part of the spine called transverse processes. As BCS falls, the ends of these bones become more pronounced and sharp to the touch. Short rib scores can be influenced by rumen fill. When the rumen is full, the “triangle” below the short ribs is filled on the animal’s left-hand side, giving the impression that the animal is carrying more condition than it actually is.

Can the short ribs be easily felt? Are the ends of the ribs sharp, smooth or rounded?

![BCS Short Ribs](image)

When scoring cattle it important to view the right-hand side of the animal so as not to be influenced by rumen fill.

- If the short ribs have a “gloved fingers” appearance, BCS is less than 4.0.

**Hip bones**

Sometimes referred to as “hooks” or “hook bones”. Are the hip bones angular and sharp or are they smooth and rounded?

![BCS Hip Bones](image)

- Place a cupped hand over the hip bone. If the hip bone is rounded and will fit comfortably into a cupped hand, BCS will be 4.0 or more.
- If there are “dimples” either side of hip bone, BCS will be 3.0 or less.
Pin bones

The pin bones protrude either side of the tailhead and become rounded with fat deposits as BCS increases. Are there dimples/indentations between the points of the pin bones? Are the pin bones angular or rounded?

<table>
<thead>
<tr>
<th>BCS 3.0</th>
<th>BCS 4.0</th>
<th>BCS 5.0</th>
<th>BCS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
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<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>

If the pin bone forms a tap-like shape, BCS is 4.0 or less.

Tailhead

When assessing the tailhead, we are looking at the presence and depth of the hollows between the pin bones and the tail itself.

<table>
<thead>
<tr>
<th>BCS 3.0</th>
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<th>BCS 6.0</th>
</tr>
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<td><img src="image8.png" alt="Image" /></td>
</tr>
</tbody>
</table>

With animals restrained, use your fingers as a depth gauge to estimate the degree of indentation. Does the indentation on either side of the tail base form a “U” or a “V” shape?

- If the tail head is a shallow “U” shape, BCS is 4.0 or above.
- If the tail head is a deep “V” shape, BCS is 3.0 or below.
Rump

The rump is the area between the hip bone and the pin bones. As BCS increases, this area fills from hollow to dished then flattened to bulging and “beef” like. Is the area deeply sunken, hollow or flat?

<table>
<thead>
<tr>
<th>BCS 3.0</th>
<th>BCS 4.0</th>
<th>BCS 5.0</th>
<th>BCS 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
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<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Draw an imaginary line from hip to pin bones following the contour of the rump.
Is the line flat, dished or does it form an open “V”? If the rump forms an open “V”, BCS is 3.0 or less.

Thighs

Best viewed from the side and rear of the animal, the thigh can be the hardest area to assess. As BCS increases, the areas below the rump and above the hocks fills out. Are they indented, flat or rounded?

<table>
<thead>
<tr>
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<th>BCS 4.0</th>
<th>BCS 5.0</th>
<th>BCS 6.0</th>
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<tbody>
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<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
</tr>
</tbody>
</table>

If the muscle structure of the thigh is visible, BCS is less than 4.0.
### Table 2. What to look for when body condition scoring – graphics

<table>
<thead>
<tr>
<th>BCS</th>
<th>3.0</th>
<th>4.0</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>- Rear view</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>- Side profile</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Long Ribs</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Short Ribs</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Hips</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Pins</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Tailhead</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Rump</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
<tr>
<td>Thigh</td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
<td><img src="Example" alt="Image" /></td>
</tr>
</tbody>
</table>
### Table 3. What to look for when body condition scoring – descriptors

<table>
<thead>
<tr>
<th>BCS</th>
<th>3.0</th>
<th>4.0</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Backbone</strong></td>
<td>Prominent ridge. “roofing-iron” corrugations</td>
<td>Ridge raised. Ridgeline, uneven and bumpy to touch</td>
<td>Ridge easily visible but rounded and smooth</td>
<td>Ridge forms a bump. Starting to round across the short ribs</td>
</tr>
<tr>
<td><strong>Long Ribs</strong></td>
<td>Four to five ribs easily seen</td>
<td>Two to three ribs visible but rounded. Ribs easily felt</td>
<td>Not visible but rounded to the touch</td>
<td>Well-rounded with fat cover felt</td>
</tr>
<tr>
<td><strong>Short Ribs</strong></td>
<td>Prominent with edges sharp to the touch</td>
<td>Individual ribs can be seen. Rounded at the ends</td>
<td>Rounded individual ribs not visible but can be felt</td>
<td>Rounded with fat cover felt</td>
</tr>
<tr>
<td><strong>Hips</strong></td>
<td>Angular, sharp edges. Depressions on sides appearing</td>
<td>No sharp edges (smooth). Flattened top</td>
<td>Rounded. Curved in profile</td>
<td>Rounded with fat cover starting to appear</td>
</tr>
<tr>
<td><strong>Pins</strong></td>
<td>Tap-like appearance. Sharp edges</td>
<td>Tap-like appearance. Rounded edges</td>
<td>Rounded</td>
<td>Well-rounded. Fat cover starting to appear</td>
</tr>
<tr>
<td><strong>Tailhead</strong></td>
<td>Deep “V” shape depression. Tailhead prominent, bumpy profile</td>
<td>Shallow “U” shape. Tail smooth. Base around tailhead is sunken</td>
<td>Tail rounded. Depression under tail filled. Even, no sharp edges</td>
<td>Fat cover starting to bulge</td>
</tr>
<tr>
<td><strong>Rump</strong></td>
<td>Deeply dished</td>
<td>Slightly depressed. Dished</td>
<td>Flat, even cover</td>
<td>Starting to round</td>
</tr>
<tr>
<td><strong>Thigh</strong></td>
<td>Indented. No visible fat. Muscle structure defined</td>
<td>Slight depression</td>
<td>Smooth and flat</td>
<td>Starting to round</td>
</tr>
</tbody>
</table>
**When to score**

The most important time to body condition score cows is during summer and autumn. This allows individual groups of cows to be managed differently (see pages 32-35) to ensure BCS targets at calving are met.

A **pre-Christmas assessment** determines if cows have gained BCS since planned start of mating and a management plan for the autumn can be set up.

Assessing cows in **mid-February to mid-March** determines if the management plan is working or whether some cows should be dried off early, milked once-a-day (OAD) or preferentially fed.

Assessing BCS **pre-calving** (in springer mob) determines if the autumn management plan achieved the calving BCS targets and whether there is a need to re-assess management practices for next autumn.

An assessment of BCS at **planned start of mating** helps determine how much BCS cows lost between calving and mating. This will identify if getting cows back in calf is at risk as well as whether anything should have been done differently to prevent the BCS loss.

**How many cows to score**

The greater the percentage of animals assessed, the more accurate the result. However, for groups in excess of 100 cows, a minimum of 70 cows should be scored when determining a herd average. These cows should be selected at random.

With practice, scoring 70 cows should take no more than 30 minutes.

**Where to score**

**Calibration**

It is essential for the BCS assessor to ensure that they are consistent each time they score. Failure to regularly re-calibrate leads to variation in scoring. Uncalibrated assessors can be 1.0 BCS units above or below the standard. This can lead to poor management decisions.

There are a number of options to improve scoring accuracy:

- Use the DairyNZ *Body Condition Scoring Made Easy* field guide as a reference to confirm the score given
- Score 10 to 15 animals in vet/AB race before herd scoring
- Score cows with your vet/consultant and compare results
- Use on-line resources ([dairynz.co.nz/bcs](http://dairynz.co.nz/bcs))
- Attend DairyNZ BCS training workshops.
**Vet/AB race scoring**

The most accurate method to BCS and the best way for an assessor to re-calibrate is with 10 to 15 cows restrained in a vet/AB race using the DairyNZ *Body Condition Scoring Made Easy* field guide as a reference.

Pick 10 to 15 cows with a range in BCS. By getting “hands on”, each of the eight body parts of the cow can be felt to get an accurate assessment of the amount of fat deposited. After each body part is scored, the scores are added together and divided by eight to give an overall score for the individual cow.

**Scoring the herd in the field**

Although most accurate, assessing cows in the vet/AB race is time consuming and not practical when scoring large numbers of cows. Once confident and calibrated using the “hands on” method described, cows can be scored in the paddock. Once again the DairyNZ *Body Condition Scoring Made Easy* field guide should be used as a point of reference. The assessment of the herd should be done quietly moving through the herd scoring groups of 8 to 10 cows.

Paddock scoring is a quick and reasonably accurate way to assess herd BCS. However, it is important that the cows are selected at random, so that a true representation of herd BCS is recorded. Body condition scoring should be done from the right-hand side and the rear of the cows to minimise the effect of rumen fill. Scores can be recorded on a BCS recording sheet.

**DairyNZ BCS recording sheet**

<table>
<thead>
<tr>
<th>Condition score</th>
<th>2.5</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>5.5</th>
<th>6.0</th>
<th>6.5</th>
<th>7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cows</td>
<td>13</td>
<td>27</td>
<td>33</td>
<td>27</td>
<td>14</td>
<td>8</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total BCS</td>
<td>39</td>
<td>94.5</td>
<td>132</td>
<td>121.5</td>
<td>70</td>
<td>44</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of sample</td>
<td>10.3%</td>
<td>21.4%</td>
<td>26.2%</td>
<td>21.4%</td>
<td>11.1%</td>
<td>6.4%</td>
<td>3.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Average Condition Score:**

<table>
<thead>
<tr>
<th>Total CS</th>
<th>Divide by</th>
<th>Total Number of cows</th>
<th>=</th>
<th>Average BCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>B 525</td>
<td></td>
<td>A 126</td>
<td></td>
<td>4.2</td>
</tr>
</tbody>
</table>

Blank sheets can be downloaded from dairynz.co.nz/bcs
Although convenient, scoring cows in the farm dairy whilst they are being milked is not ideal. In most situations the pit/bail configuration and presence of the rump and kick rail makes it impossible to see and assess all eight body parts from the cupping position.

However, with the use of a suitably positioned trained assessor, lighter conditioned animals can be identified, marked and drafted from the milking herd as they progress through the milking process. Once drafted, a secondary assessment can be made in the holding pen to confirm BCS decisions if necessary.

The limited view from the pit makes accurate BCS assessment difficult.
Rotaries

With the use of a raised platform in a rotary dairy, an assessor can view the pin bones, hip bones and tailhead and can make a reasonably accurate assessment of the backline, short ribs and rump. With practice an assessor should be able to identify and draft lighter conditioned animals.

Herringbones

Decisions around drafting cows in a herringbone are best made, where possible, from the head of the animal looking over the backline and making an assessment based on the backline, hip bones, short ribs and top of the long ribs.
Animal welfare and BCS

The law takes animal welfare very seriously and has strict rules relating to animal transport and suffering. The following information is designed to help you decide if an animal is fit for transport.

From the MAF Dairy Cattle Code of Welfare*: Minimum Standard 18 – Pre-transport Selection

1. The person in charge must examine the selected dairy cattle prior to transport to ensure that all animals are fit and healthy for transportation
2. All dairy cattle must be able to stand and bear weight on all four limbs and be fit enough to withstand the journey without suffering unreasonable or unnecessary pain or distress
3. Any animal likely to give birth during transport must not be selected.

Animals must not be transported if they display any injuries, signs of disease, abnormal behaviour or physical abnormalities that could compromise their welfare during the journey, unless a current veterinary certificate as to the fitness of the animal for transport has been completed.

Animals with a BCS below 3.0 are subject to transport restrictions; use the following chart to help you decide if your animal is fit for transport.

Note: This chart is only a guide and does not guarantee acceptance of livestock for transport or processing.

* For further information on the Dairy Cattle Code of Welfare contact DairyNZ on 0800 4 DairyNZ (0800 4 324 7969)

How to assess an animal’s fitness for transport

![Flowchart diagram showing decision process for animal fitness for transport based on BCS and vet certificates.]

Fit for transport
To saleyard, processor or alternate property

Fit for conditional transport
Direct to processor or an alternate property for additional feed/weight gain (not to saleyard)

Do not transport
Options include on-farm slaughter or feed and veterinary treatment
Is your animal fit for transport?

Example of BCS 2.5

Table 4. BCS 2.5 – what to look for

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone</td>
<td>Very prominent, with visible notches that can easily be counted.</td>
</tr>
<tr>
<td>Long ribs</td>
<td>The long ribs may be visible as far down as the top of the udder.</td>
</tr>
<tr>
<td>Short Ribs</td>
<td>Clearly visible and easily counted. The short ribs will have very sharp edges.</td>
</tr>
<tr>
<td>Hip</td>
<td>Deep depressions on the side of the hip bone.</td>
</tr>
<tr>
<td>Pins</td>
<td>Very clear, three pronged tap formation.</td>
</tr>
<tr>
<td>Tailhead</td>
<td>Very prominent and angular, with a very deep “V” shape.</td>
</tr>
<tr>
<td>Rump</td>
<td>Severely depressed (hollow).</td>
</tr>
<tr>
<td>Thigh</td>
<td>No visible fat and very little muscle.</td>
</tr>
</tbody>
</table>
Training to BCS

Body condition scoring of dairy cattle is a valuable management tool; however, it must be applied correctly and consistently to be effective as an on-farm measure. Training is required to enable accurate and consistent body condition scoring. Once trained, regular reference to the DairyNZ Body Condition Scoring Made Easy field guide is recommended to keep familiar with the body condition scoring process.

DairyNZ has developed a BCS training course which is delivered in workshop format and is available to farmers and rural professionals.

The objectives of the DairyNZ BCS training course are to enable participants to:

- Have a good appreciation of the need for a consistent BCS system across the industry
- Be able to demonstrate consistent application of the BCS system outlined in the DairyNZ Body Condition Scoring Made Easy field guide
- Have a clear understanding of the application of BCS in relation to productivity targets and correctly report optimal BCS targets for all ages of cattle at drying off, calving and mating
- Have a clear understanding of BCS in relation to animal welfare minimum standards and, when asked, be able to demonstrate that knowledge by correctly identifying appropriate courses of action for low BCS animals.

During the DairyNZ BCS training course, participants will:

- Identify the parts of the cow that are assessed during body condition scoring
- Compare and associate the written descriptors with visual cues
- Discuss the reasons for variation in assessor-nominated BCS
- Complete hands-on assessment of cows with a range of BCS
- Complete BCS assessment of cows in the paddock
- Discuss the importance of BCS as a tool for farmers and the value proposition of the BCS targets recommended
- Discuss the requirements for BCS that are contained within the Code of Welfare for Dairy Cattle, and who has responsibility for the minimum standards within the Code
- Discuss the requirements for BCS as they relate to the transport of animals
- Define and describe a cow that is less than BCS 3.0.

Ongoing practice is important to maintain skills for body condition scoring.

To find out about DairyNZ Body Condition Scoring workshops contact DairyNZ:

0800 4 DairyNZ (0800 4 324 7969)
info@dairynz.co.nz
Section 2

BCS targets
**BCS targets**

**Mature cows**

- Calve at a BCS of 5.0, with:
  - not more than 15% of herd less than BCS 5.0, and
  - not more than 15% of herd greater than BCS 5.5
- In farm systems using low levels of supplementary feed (<500 kg DM/cow), mature cows should be BCS 4.0 at least 100 days before calving (see Figure 1)
- In farm systems using higher levels of supplementary feed, sufficient supplementary feed (see Table 5, page 32) and time must be allowed for cows to gain the required amount of BCS (see Figure 1)
- Even with exceptional feeding, cows rarely gain more than 0.5 BCS units in a month
- It is unrealistic to expect more than a 0.5 BCS unit gain from cows on winter crop, taking into account the adjustment time to the crop
- Cows do not gain BCS in the month before calving because so much energy is required for pregnancy (approximately 60% of the energy needed for pregnancy is required in the last month before calving). This equates to approximately 4-5 kg DM/cow/day for pregnancy
- Average loss of BCS in early lactation should not be more than 1.0 BCS unit, because greater average losses indicate that too many cows have lost 1.5 or more BCS units. If calving BCS is right, not more than 15% of cows should be below BCS 4.0 at planned start of mating. Greater losses indicate poor feeding from six weeks post-calving, ill health or a cow that was greater than BCS 5.5 at calving
- Early calving cows should be gaining BCS before planned start of mating.

**Second calvers (rising three-year-olds)**

- Calve at a BCS of 5.5
- BCS 5.0 by 60 days before calving

**First calvers (rising two-year-old heifers)**

- Calve at BCS of 5.5
- BCS 5.5 by 60 days before calving.
Any cow with a BCS less than 3.0 requires your immediate attention.

Example of mature cow at BCS 5.0

Example of young cow at BCS 5.5
Why achieving BCS targets makes the difference

Fatter cows at calving produce more milksolids. However, the gain in milksolids gets smaller as calving BCS increases. Fatter cows eat less than thin cows and lose more BCS after calving. Cows that lose more than 1.5 BCS units in early lactation produce less milksolids. Therefore, cows should not be too fat.

Optimum calving BCS for milk production is about BCS 6.0. However, the extra gain in milksolids from 5.0 to 6.0 is small (6 kg MS). For mature cows the increased cost of achieving this BCS as well as the increased risk of metabolic disorders does not justify the investment.

Mature cows should calve at BCS 5.0 for greatest energy efficiency for milk production.

Cows that are fatter at calving will cycle earlier and are more likely to get pregnant early in the breeding season. Fatter cows also lose more BCS in early lactation and cows that lose more than 1.0 BCS unit after calving are less likely to get pregnant.

Mature cows should calve at a BCS of 5.0 to maximise reproductive efficiency.

First and second calvers are less likely to be submitted in the first three weeks of mating than mature cows and are at a lower risk of metabolic disorders.

Younger cows (rising two and three-year-old) should be BCS 5.5 at calving to improve their chances of becoming pregnant early.
Thin cows at calving (less than BCS 4.0) have an increased risk of mastitis and uterine infections, especially in young cows.

**To reduce the likelihood of first and second calvers having mastitis or uterine infections, young cows should calve at BCS 5.5.**

Cows thinner than BCS 3.5 at calving or fatter than 6.0 at calving are at an increased risk of metabolic disorders around calving.

**Calving mature cows at BCS 5.0 minimises the risk of metabolic disorders.**

Thinner cows at calving are more likely to have bull calves the following calving. Herds calving at BCS 4.0 will have 5% fewer replacement heifers, on average, than herds calving at 5.0.

**Calving cows between 5.0 and 5.5 improves the chances of having adequate replacement heifers the following season.**

Daughters from cows that lose excessive BCS in early lactation produce less milk and have reduced reproductive success.

**Cows fatter than 5.5 at calving will lose more than 1.0 BCS unit after calving and daughters born the following year are likely to produce less milk and are at an increased risk of reproductive failure when they mature.**
Section 3
Strategies to achieve targets
How to achieve BCS targets

There are a number of strategies that allow you to achieve BCS targets at calving. Drafting cows based on BCS, age and time of calving, milking OAD and running more than one herd may be appropriate. It is likely that a mix of the strategies will need to be implemented to ensure all cows achieve the BCS targets.

Early dry-off

This strategy involves trading off autumn milk production by drying cows off to reach BCS targets before the winter. The milk foregone in the autumn is approximately equal to the production gained the following spring. So there is no net change in milk revenue.

There are gains in fertility from ensuring cows reach the BCS targets at calving. These are estimated at $40/cow for each BCS unit.

There are also additional benefits from cows calving at target BCS that cannot be easily valued economically. These include the sustainability of the system in difficult springs and the public’s perception around thin cows.

If this strategy is appropriate, DairyNZ recommends a staggered dry-off based on rules outlined in Table 5.

Table 5. Drying off time based on cow BCS and time to calving to achieve target calving BCS

<table>
<thead>
<tr>
<th>Body condition score</th>
<th>Days cow needs to be dry before calving</th>
<th>Autumn pasture (days)</th>
<th>Autumn pasture and high quality supplement fed above maintenance (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature cow</td>
<td>Rising three-year-old</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>3.5</td>
<td>160</td>
<td>120</td>
</tr>
<tr>
<td>3.5</td>
<td>4.0</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>4.0</td>
<td>4.5</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>4.5</td>
<td>5.0</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>5.0</td>
<td>5.5</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>5.0</td>
<td>5.5</td>
<td>Calving</td>
<td>Calving</td>
</tr>
</tbody>
</table>

Note: Includes 10 days when cows are being dried off and not gaining BCS and 30 days when cows do not gain BCS before calving. For this strategy to work, dry cows must be allocated a minimum of 9-11 kg DM/day (depending on breed).

For early dry-off to be successful, dry cows must be allocated 9-11 kg DM/day (depending on breed).
Once-a-day milking for all or part of the herd in mid-late lactation

Once-a-day milking in mid-late lactation can be used as a strategy to improve BCS at dry-off while achieving relatively long lactations. The strategy spares energy from activity (walking) and milk production and alters physiological processes towards BCS gain.

The key to successfully using this strategy while not unduly affecting milk production is to increase lactation length so that total milk production remains similar to what it would have been if cows continued to be milked twice-a-day.

OAD milking as a strategy for BCS gain can only be used where the bulk milk somatic cell count (SCC) can be managed (i.e. kept under 400,000 cells/ml). Somatic cell count generally doubles for two to three days after cows have been switched to OAD. After this it tends to decline to approximately 50,000 cells/ml above what it had been. Therefore, OAD should only be recommended for herds with a SCC below 200,000 at the time that the switch to OAD is planned.

Where farms have a set day to dry-off regardless of conditions, lactation length will not be increased in the OAD strategy. This will unduly punish milk yield as the extra days in milk will not be achieved (5-10% of total milk yield depending on the length of time cows are milked OAD).

Part-season OAD is a particularly good option for farms that run multiple herds in their system. In mid to late lactation, the cows that will benefit most from achieving the BCS targets (low BCS, early calvers and rising three year olds) can be milked OAD in a separate herd, with any high BCS or high SCC cows maintained on twice-a-day. On average, cows milked OAD for three months in late lactation will be 0.5 BCS units fatter at dry-off than those milked twice-a-day, providing cows milked OAD are well fed.

Autumn supplements

Feeding supplements in the autumn to milking cows is of limited use for achieving calving BCS targets unless cows were to lose BCS if not supplemented (i.e. insufficient pasture – grazing residuals below 7-8 clicks on the rising plate meter). Cows selected for high milk production preferentially partition nutrients to milk production and not BCS gain. They, therefore, tend to be thinner in late lactation and the feeding of supplement results in more milk production not BCS gain.

Experimental results suggest that supplementing cows with an additional 400-500 kg DM/cow of a high quality supplement in mid to late lactation resulted in only a 0.25-0.50 unit increase in BCS by the original dry-off date because most of the additional feed eaten was used by the cow for milk production.
Supplement feeding to dry cows

If the infrastructure exists to achieve high supplement utilisation when feeding to dry cows during winter, this can be an effective strategy to maximise lactation length while achieving BCS targets. It is important to separate the herd into different BCS mobs to avoid some cows becoming too fat at the expense of other cows not achieving targets.

Where generous intakes can be achieved with a mixture of pasture and good quality supplement (10-12 kg DM/day eaten, depending on breed), 1.0 BCS unit gain can be achieved in 45-60 days. Cows will not achieve these levels of gain solely on a pasture diet.

The feed requirements (kg DM) for 1.0 unit BCS gain from different feeds are presented in Table 6, page 49.

Winter grazing

Winter grazing may look feasible in theory, but in practice it is difficult for cows to gain BCS on pasture alone (11.0 MJ ME/kg DM) and they need to be generously fed (i.e. leave high residuals) to gain weight. Because of this, cows rarely gain weight at winter grazing. The quality of winter grazing needs to be assessed. If the feed is low quality (kikuyu or browntop) or feed utilisation is poor, cows may even lose BCS.

Winter grazing does have other benefits, especially if the milking platform is wet, by reducing pugging damage and, therefore, protecting future pasture growth.

Wintering on crops (e.g. kale, swedes, fodderbeet)

Winter crops are generally considered an economical option for feeding cows to gain BCS in regions where pasture growth is insufficient to meet cow demand during winter (e.g. South Waikato, Central Plateau, Canterbury and Southland). Swedes, kale and, more recently, fodder beet have been the primary crops used.

Anecdotal evidence suggests that when allocating crops on a MJ ME basis and allowing for efficiency of utilisation there was no difference in the final BCS of cows between crops. However, there is some research data that indicate that cows require less fodder beet to gain 1.0 unit of BCS than swedes or kale (see Table 6, page 49).

Although cows may graze off on winter crops for 8-10 weeks, case study results suggest cows gain around 0.5 of a BCS unit during this period when well fed. Unless smoothly transitioned from pastures to crops, cows do not gain much BCS in the first 3-4 weeks due to the adjustment to a change in diet. Therefore, sufficient time must be allowed between dry-off and calving to ensure that cows achieve the BCS targets. Correct management and feed allocation are the most important factors in ensuring cows achieve target BCS.

Determining accurate dry matter yields and allocating crop correctly remain the key factors influencing successful wintering on crops.

Refer to DairyNZ Farmfacts Fodder Beet – feeding to dairy cows (1-73), Winter crops – feeding to dairy cows (1-75) and other relevant pages on the DairyNZ website – Southern Wintering Systems (dairynz.co.nz/southernwinteringsystems) for more information.
** Preferential feeding for at risk cows  

Cows that are very light (BCS 3.5 or less) will require preferential treatment. The following need to be considered:

- Are the cows in poor condition for reasons other than feeding (e.g. lameness, facial eczema, mineral deficiency, parasites, infection, disease, etc)? If in doubt get the animals checked by a veterinarian
- Remove any stress. Animals that need preferential treatment are best in their own herd. Dry off very thin cows
- Offer high quality feed (both pasture and supplement). Feed to generous grazing residuals (i.e. greater than 4 cm or 8 clicks on the rising plate meter). Feeds such as PKE can be offered ad lib. Refer to DairyNZ Facts and Figures for NZ Dairy Farmers, pages 22-23 for more information.

** Summary  

The BCS targets for calving are based on individual cows and not the herd average. Different combinations of strategies outlined will suit different farms depending on the farm system, infrastructure, personal preferences, region, soil type and feed demand/supply (see the case study on page 52). A mixture of these strategies for different sections of the herd may be necessary to minimise the range of BCS at calving.

The important points when planning the strategy for achieving the BCS targets are:

- Even if cows are well fed, cows rarely gain more than 0.5 BCS units in 30 days
- Cows do not gain BCS in the month before calving
- It is difficult to achieve BCS gains with “all pasture” winter grazing
- Gaining more than 0.5 BCS units on winter crop is unrealistic, without very long dry periods or having the cows adjusting to the crop when milking. Cows need time to adjust to crop before they will gain BCS
- The speed at which a cow gains BCS in autumn does not affect the rate of loss of BCS in spring.

💡 Heifers (first calvers) need to be at BCS 5.5 at 22 months of age. This requires a strategy to monitor animal health and feed to achieve this from weaning
DairyNZ body condition scoring
Section 4
The science of BCS
**BCS and dry matter intake**

Hormones released from fat stores act on the brain to reduce the “desire” to eat. Therefore, fatter cows graze for less time and eat less than thinner cows

- Data from grazing cows in New Zealand indicate a 0.5 to 1.0 kg drop in dry matter intake (DMI) with each unit increase in BCS in early, mid, or late lactation.

The negative effect of BCS on DMI is the same whether it is a result of cow genetics or environment:

- If cows are naturally thin (genetics), they have a greater drive to eat
- If cows are thin because of an earlier shortage of feed (environment), they have a greater drive to eat.

As fatter cows eat less, they lose more BCS in early lactation. This contributes to more production, but also increases the risk of health problems and may negatively affect reproduction if cows are too fat at calving.

💡 Achieving a BCS of 5.0 to 5.5 at calving is a compromise between wanting cows with energy reserves for milk production, while not being too fat and reducing DMI.
BCS and milk production

Mobilised condition in early lactation provides fatty acids for milk fat and amino acids for milk protein. Therefore, milk fat and protein yields increase with increasing calving BCS, up to BCS 6.5.

The increase in milksolids production gets smaller as BCS at calving increases (Figure 2):

- An increase in calving BCS from 3.0 to 4.0 increases milksolids production by 17 kg/cow
- An increase in calving BCS from 4.0 to 5.0 increases milksolids production by 12 kg/cow
- An increase in calving BCS from 5.0 to 6.0 increases milksolids production by 6 kg/cow.

Figure 2. Relationship between BCS at calving and annual milksolids production

Cows that lose more than 1.5 BCS units in early lactation have lower milksolids production (Figure 3).

Figure 3. Relationship between amount of BCS lost after calving and milksolids production/cow/year.

To optimise milk production, cows should calve at a BCS of 5.0 to 6.0.
**BCS and reproduction**

Body condition score at calving, BCS at planned start of mating (PSM), loss of BCS in early lactation, and whether cows are gaining Lwt before and during mating all affect fertility.

**Thinner cows at calving cycle later**
- 6% less cows detected with a pre-mating heat when they calve at BCS 4.0 than if they calved at BCS 5.0 (Figure 4)

**Figure 4. Relationship between calving BCS and the percentage of cows cycling before planned start of mating**

![Graph showing the relationship between calving BCS and the percentage of cows cycling before planned start of mating.](image)

**Thinner cows at PSM have lower pregnancy rates**
- 6-week in-calf rate is 4 to 5% lower in cows at BCS 3.0 at PSM compared with cows at BCS 4.0 (Figure 5).

**Cows that lose more BCS in early lactation have lower pregnancy rates**
- Cows that lose 1.5 BCS units after calving have 2% lower 6-week in-calf rates than cows that lose 1.0 BCS unit.
To optimise reproduction, cows should calve at a BCS of 5.0 to 6.0.

Figure 5. Relationship between BCS at planned start of mating and 6-week in-calf rate

Cows gaining live-weight (Lwt) during the breeding period are more likely to get pregnant, but this effect is small

- Doubling Lwt gain from 0.2 to 0.4 kg/day during breeding increased 6-week and 12-week in-calf rate by less than 1%.

Important points

- Many factors affect reproduction. Body condition is just one of these factors. If your herd’s reproductive performance is less than industry targets, check the InCalf resources at dairynz.co.nz/incalf
- Management and/or nutrition have very little effect on BCS loss for the first four to five weeks post-calving
- Fatter cows at calving cycle earlier but thinner cows lose less BCS after calving. Therefore, the key is to optimise the benefits of these drivers by calving cows at a BCS of 5.0
- Younger cows (rising two and three year old) should be 0.5 BCS units fatter than mature cows at calving to optimise reproductive performance.
**BCS and health**

The effect of calving BCS and BCS in early lactation on animal health is inconsistent and depends on what aspect of animal health is being considered.

Metabolic disorders that occur around calving appear to be more prevalent when cows are fat at calving (greater than BCS 6.0), although the risk of milk fever is greater in both fat (greater than BCS 6.0) and thin (less than BCS 3.5) cows. The risk of ketosis doubles when calving BCS in mixed aged cows increases from 5.5 to 6.0.

Calving BCS or change in BCS before calving does not affect calving difficulty or the risk of a stillbirth.

A difficult calving results in greater BCS loss post-calving.

Studies have shown that thinner young cows at calving are more likely to have mastitis and uterine infections in early lactation. The same effect was not evident in mature cows. These data are supportive of BCS targets for first and second calvers being higher than mature cows.

There is no consistent relationship between calving BCS or BCS loss in early lactation and the incidence of lameness.

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The international science literature is supportive of recommendations that mature cows should calve at BCS 5.0 and first and second calvers should be BCS 5.5 to optimise animal health.

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**BCS and other important traits**

Body condition score at calving and in early lactation can influence other traits that are important to the profitability and sustainability of the farm system.

- Fatter cows at calving are more likely to give birth to a heifer calf the following year
  - Every unit increase in BCS at calving increases the probability of a heifer calf in the future by approximately 5%

- Heifers born to cows that lose excessive BCS during early lactation produce less milk and have reduced reproductive capacity.

It is, therefore, important that a cow is sufficiently fat at calving to maximise replacement heifers, but not so fat as to undermine the productive and reproductive ability of these heifers.

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A moderate BCS at calving of 5.0 for mature cows and 5.5 for two and three year old cows is recommended.
**BCS and dairy cow welfare**

Animal welfare is a complex and emotive area.

High and low BCS pre-dispose cows to diseases/metabolic disorders, low productivity, and low reproductive function, all of which imply compromised welfare (Figure 6).

**Figure 6. A stylised relationship between animal welfare and body condition score.**

What is defined as high or low BCS will vary with time of year (e.g. a BCS of 3.5 would be very thin at calving, but is not uncommon at peak lactation). However, the same BCS targets that optimise productivity ensure animal welfare requirements are met.

Animal welfare reflects the needs of the individual animal and not the herd. Therefore, adhering to animal welfare requirements involves managing the herd to ensure the welfare of an individual cow is not compromised. The range of BCS within a herd is, therefore, as important as the average BCS of the herd.

The *Dairy Cattle Code of Welfare 2010* has identified a minimum acceptable standard of BCS 3.0. Visit [dairynz.co.nz](http://dairynz.co.nz) to download a copy.

When the BCS of any animal falls below 3.0, urgent remedial action must be taken to improve BCS.
Section 5

Factors that affect BCS
**Time from calving**

In pasture-based systems, the profile of BCS change through lactation is the shape of a ‘W’ (Figure 7).

**Figure 7. Typical profile of BCS change in a pasture-based system.**

Cows are predisposed to lose BCS for 50 to 100 days after calving. This is natural and is largely regulated by genetics. There is very little that can be done to reduce the amount of BCS lost, particularly during the first four to five weeks after calving.

Following the post-calving period of BCS loss, cows begin to gain BCS. This BCS gain is affected by both genetics and nutrition. In general:

- High milk production cows gain less BCS than low yielding cows while milking
- Cows fed supplement that contain non-structural carbohydrates (i.e. starch and sugar) gain more BCS than cows fed pasture alone.

With the decline in mid-season pasture quality (and possibly insufficient quantity), BCS gain slows down or cows lose BCS once more. In the North Island, in particular, cows lose BCS again in January and February. This loss of BCS is different to the loss in BCS post-calving and can be minimised by ensuring pasture quality is high or by providing the cow with high quality supplementary feeds when there is insufficient pasture.

With milder autumn weather, pasture quality improves and cows gain BCS again. However, BCS gain is limited until the cows are dried off.

Particular attention must be paid to first lactation animals in the second half of lactation. New Zealand research results suggest that these animals do not gain BCS as quickly as mature herd mates. As a result, second calvers will be thinner than mature cows at calving unless preferentially managed in the autumn.
Up to 60% of the variation in BCS within a herd can be due to the genetic makeup of the cows. Heritability estimates for BCS change are less than 10%.

**A heavy emphasis on genetic selection for milk production results in lower BCS cows (Figure 8).**

This was particularly evident in the New Zealand Strain Trial, in which New Zealand HF cows of 1970s genetic merit (NZ70) were compared with New Zealand HF cows of 1990s genetic merit (NZ90) and HF cows originating from the USA and Europe in the 1990s (OS90). On average, NZ90 cows were 0.3 BCS units thinner than NZ70 cows and OS90 cows were 0.4 BCS units thinner than NZ90 cows. The results confirm that selection for increased milk yield resulted in selection for low BCS.

**Figure 8. Approximate BCS at dry off in four different strains of dairy cows.**

With greater selection for milk production, BCS at dry off has declined.

Not all cows will change BCS in the same way when fed the same diet

Genetic correlations between BCS in different environments are not constant, implying that the gene or genomic region that influences BCS may differ depending on the prevailing environmental conditions to which the animal is exposed. This is also evident in the New Zealand Strain Trial, where NZ90 cows partitioned a proportion of supplementary feed towards BCS gain, while OS90 cows partitioned the additional feed towards increased milk production. Other genetic strain comparison studies in New Zealand reported similar findings.
Nutrition

BCS gain in milking cows

Body condition score loss during the first four to five weeks post-calving is not influenced by nutrition.

Body condition score after this point can be influenced by nutrition, but there is an interaction with genetics. Cows selected for high milk production preferentially partition nutrients to milk production and not to BCS gain.

For example:

- NZ90 cows receiving 65 kg/cow maize grain-equivalent (2 kg/cow/day for a month) as a supplement to pasture in mid to late-lactation, gained 0.1 BCS units (1 BCS unit from 650 kg maize grain)

- OS90 cows only partitioned maize grain supplement to BCS gain when they received 6.5 kg/cow/day as supplement to fresh pasture and, even then, required 170 kg maize grain equivalent to gain 0.1 BCS units (1 BCS unit from 1,700 kg maize grain).

These results highlight the difficulty in increasing BCS gain while cows are milking, although there is evidence that they utilise energy more efficiently for BCS gain than when dry.

BCS gain in dry cows

In comparison, BCS increases much more quickly when cows are offered supplements to pasture after they have been dried off. However different feeds are used with different efficiencies for BCS gain.

Energy in autumn pasture is used inefficiently for gaining BCS. Energy from feeds like pasture silage, palm kernel extract (PKE) and maize silage are used 50% more efficiently (Table 6).
Table 6. Approximate amounts (kg DM) of ‘commonly used feeds’ required for a 1.0 unit increase in BCS.

These are requirements above maintenance, activity and pregnancy requirements. They do not include wastage. Estimates of wastage can be found in DairyNZ Facts and Figures, page 31.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Kg Lwt$^1$</th>
<th>Kg Lwt/ BCS</th>
<th>Autumn Pasture</th>
<th>Pasture Silage</th>
<th>Maize Silage</th>
<th>PKE</th>
<th>Kale$^2$</th>
<th>Swedes$^3$</th>
<th>Fodder Beet$^2$</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>MJ ME/kg DM</td>
<td></td>
<td>11.5</td>
<td>10.5</td>
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</tr>
<tr>
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<td>115</td>
<td>85</td>
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<tr>
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<tr>
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<td>205</td>
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<tr>
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<td>180</td>
<td>135</td>
<td>235</td>
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</table>

$^1$Live weights are for the cow only and exclude the weight of the foetus.
$^2$Requirements for kale and fodder beet were estimated relative to requirements for grass silage from Keogh et al. (2008)
$^3$Requirements for swedes were estimated as the average of kale and fodder beet

Notes:

- The reason why different feeds have different effects on BCS gain is currently not known, but the results are based on feeding studies in New Zealand
- The difference in feed requirements between maize silage, PKE and pasture silage is not statistically significant – this means that we cannot say with certainty that the numerical difference is real. However, this is the best information available for New Zealand farmers
- The figures presented are average feed requirements for a 1.0 unit gain in BCS
- The amount of feed required to gain BCS increases later in pregnancy. Realistically, cows do not gain BCS during the last month before calving because of the energy demands of foetal growth
- Dry (non-lactating) cows struggle to eat more than 3.5 kg of PKE/day.
50 DairyNZ body condition scoring
Section 6
Appendices
Case study

How the Southland Demonstration Farm achieved BCS targets in 2011

In 2010/11, cows on the Southland Demonstration Farm (SDF) did not gain any significant BCS between the mating period and the start of autumn. The autumn management plan was, therefore:

- To get all cows to BCS 4.5 by drying off and for cows to gain another 0.5 BCS during winter.

**Autumn management**

The cows were split into three herds based on BCS and managed to achieve the BCS targets. All three herds were grazed to a consistent even residual. The herds were split and fed as follows:

- Low BCS cows (<4 BCS) were milked OAD and fed 2 kg DM/cow of whole crop silage plus pasture from 130 days pre-calving
- Cows at BCS 4.0 to 4.5 were milked TAD and fed 2 kg DM/cow of whole crop silage plus pasture from 130 days pre-calving
- Cows at BCS 4.5 or above were milked TAD and only fed whole crop silage from 100 days pre-calving.

By 70 days pre-calving (end of May), the average BCS of the herd lifted from 3.8 to 4.2 and the range in BCS had been reduced. In addition, only 2% of the cows were less than BCS 4.0, compared with 42% of cows at the start of autumn.

Although the strategy only changed average herd BCS by 0.4 BCS units by the end of autumn, all of this gain was in the thinner cows, reducing the BCS range within the herd and ensuring that the entire herd were at a sufficiently high BCS at dry-off to allow them to achieve the calving BCS target of 5.0 by calving.

**Winter management**

Winter management involved prioritising feed resources to ensure the thinnest cows were given the greatest opportunity to gain BCS:

- Cows at BCS 4.0 were wintered on fodder beet plus baleage and allocated enough feed to gain at least 0.75 of a BCS unit
- Cows that were at BCS 4.5 or greater were wintered on swedes and allocated enough feed to gain 0.5 of a BCS unit.

By the end of winter, 70% of the cows were BCS 5.0 or above, 27% of cows were at BCS 4.5 and only 3% were BCS 4.0.

Although the calving BCS targets were not entirely met, the proactive management during autumn to achieve target BCS by dry-off and together with winter management significantly helped reduce the range in BCS by calving. This was the first time on this farm that management decisions in the autumn were monitored at an individual cow level.
Strategies to achieve BCS targets

In 2011, DairyNZ did a modelling exercise that evaluated the impact of a range of strategies to help achieve the BCS targets on farm profitability. The summary of the key findings of this modelling exercise were:

Early dry-off (staggered dry-off based on BCS)

Autumn production lost from early dry-off is approximately equivalent to the gain in milksolids production during the following spring. However, there are additional benefits in reproduction and cow health, not to mention public perception from using early dry-off to ensure calving BCS targets are met.

Once-a-day milking in mid-late lactation

By milking cows once-a-day (OAD) in mid-late lactation (i.e. from January onwards), a cow gains more BCS and can be milked for up to two weeks longer than she would if she had remained on twice-a-day. By extending the lactation, the reduction in milk revenue is small, but the BCS gain is sufficient to ensure target BCS is achieved. However, the proviso for this option is that lactation length is not limited by a set dry-off date or by somatic cell count.

Autumn supplements

Feeding supplements in the autumn to lactating cows can be profitable providing the supplement is at least 10.5 MJ ME/kg DM, the supplement is purchased at a price where there is a profit margin and lactation length is increased. However, autumn supplements fed to lactating cows do not have a large effect on BCS gain: 400-500 kg DM/cow between February and May only improved the BCS of the herd by about 0.25-0.5 BCS units. The majority of the energy consumed ends up in milk.

Supplement feeding to dry cows

It can be profitable to feed supplement to dry cows for BCS gain in most situations. As the amount of supplement required per unit of BCS gain and wastage varies (refer Table 6, page 49) the profitability differs with the chosen supplement.

Based on experimental results, it will cost $45 to $70 (2011/12 supplement prices) for a 1.0 unit BCS gain if using PKE or maize silage efficiently. At a $6.00/kg MS milk price, this will return $70 to $90 in milksolids and $40 in reproductive benefits. However, cows are unlikely to gain more than 0.5 BCS units in a month, even when generously fed. Therefore, they must be given an adequate dry period when using this strategy. For more information refer to the BCS gain calculator on the DairyNZ website dairynz.co.nz/bcs

Read the full results from the modelling exercise in the DairyNZ Technical Series – March 2011, article ‘Achieving Body Condition Score Targets – What’s in it for you?’ Visit dairynz.co.nz/bcs
Frequently asked questions

How accurate does BCS need to be? Why do we not score to the nearest 0.25 BCS unit?

For most people, visually scoring to a greater accuracy than 1.0 BCS units requires formal training. Even with training and experience, an assessor can only score cows to a 0.5 BCS unit visually with confidence. Very experienced assessors can score cows to 0.25 BCS units if they are able to feel the main body parts. This cannot be done accurately and consistently by sight. Remember 0.25 BCS units is only 6-8 kg Lwt. Herd average BCS can be reported to 0.1 BCS units.

How do I know what BCS my herd is when my vet, consultant and consulting officer give me different averages?

DairyNZ has developed a training program to address this issue. People who attend will be certified in condition scoring to get consistency in the industry.

How can I stop the BCS loss after calving?

Cows lose BCS naturally after calving. The fatter they are at calving, the more they lose. On average, a cow calving at BCS 5.0 will lose approximately 1.0 BCS unit after calving, while a cow calving at BCS 6.0 will lose approximately 1.5 BCS units and a cow calving at BCS 4.0 will lose 0.75 BCS units.

This post-calving loss is primarily regulated by genetics and, provided the cow is healthy, cannot be influenced by management or nutrition during the first five weeks after calving. At this point, supplements will slow the rate of BCS loss and increase the rate of BCS gain. However, the effect of feeding on BCS gain is small while the cow is milking because she has been selected to turn feed into milk and not into BCS. For example, New Zealand cows took approximately 65 kg maize grain to gain 0.1 BCS in mid-late lactation (i.e. 650 kg maize grain eaten to achieve 1 BCS unit gain). The US-type Holstein-Friesians required approximately three times this amount to have the same effect.

Do we need to feed supplements to get BCS gain before/during mating?

Unless cows are feed restricted (i.e. grazing residuals are less than 3.5-4.0 cm), there will be only a small change in BCS from feeding supplements in early lactation and this is unlikely to benefit reproduction.

Is it easier to get cows in-calf feeding supplements?

This depends on the timing of feeding the supplements:

- If supplements are fed in the autumn, they will improve BCS at calving and this has major effects on how long it takes a cow to cycle and, therefore, when she gets pregnant
- If feeding supplements in the spring, they will only benefit in reproduction if grazing residuals are less 3.5-4.0 cm.
How much feed is needed for BCS gain to get improved reproduction?

Enough supplement to get heifers and second calvers to BCS 5.5 and cows to BCS 5.0! New Zealand research results indicate that 125-200 kg DM of supplement is required to achieve a 1.0 unit increase in BCS (see page 49). Heifers (rising two-year-olds) should be BCS 5.5 at 22 months as it is difficult for heifers to gain weight while they adjust to the herd hierarchy.

Second calvers, in particular, are a high risk group. Research data suggest that cows in their first lactation do not gain as much BCS in late lactation as their mature herd mates. Therefore, second calvers are often the thinnest group at calving if not preferentially managed in the autumn.

Does milking cows OAD three weeks before mating help with BCS and getting cows in calf?

Probably not in most circumstances. In an experiment investigating the impact of OAD milking prior to mating on commercial dairy farms, milking frequency did not impact on the number of cows in calf in four weeks after planned start of mating (PSM). However, in this experiment, the OAD cows came to the shed twice-a-day and this may have affected any benefit that OAD might have offered. That said, any physiological benefit that the cow may get from OAD milking is generally well before PSM. Therefore, if this is a strategy to be considered, it is probably better to target thin cows and late calving cows and place them on OAD from calving.

How does BCS affect profit?

Body condition score affects milk production, reproduction, and health, as well as other less tangible factors.

A conservative estimate of revenue from increasing cow BCS from 4.0 to 5.0 is $120 per cow (at $6.00/kg MS). Improved animal health, greater numbers of replacement heifers the following season, and improvements in the long term sustainability of the system are not included in this figure.

In comparison, it is estimated that a 500 kg cow requires 125-160 kg of palm kernel extract or maize silage to gain a BCS unit while dry ($45 to $70 feed expense including wastage).

If short of feed, what is the best option: increase BCS before calving or save feed for the milkers after calving?

The aim is to get more than 85% of cows to BCS 5.0 and all first calvers to BCS 5.5. The greatest return from extra feed will be from increasing the BCS of the lightest cows. Sort mobs and feed better conditioned cows maintenance levels.

From six to eight weeks pre-calving, building average pasture cover needs to be a priority. Experiments at DairyNZ indicate a loss of about 0.25 BCS units and 4 kg milksolids/cow when cows were severely restricted (50% restriction) each day during the last month before calving. A similar restriction (in kg DM terms) for five weeks after calving cost more than 30 kg milksolids/cow, but did not affect BCS. However, the cows restricted pre-calving calved at BCS 4.5.

Supplements can be purchased to ensure cows are well fed and are gaining BCS while also achieving pasture cover targets.
Milk price next season is expected to be lower than this year. I can’t afford to dry-off early on BCS.

Historically milk price has varied by more than plus or minus a dollar per kg MS on initial predictions at the start of the season. Therefore, management decisions on drying off to achieve BCS and pasture cover targets and supplement purchases need to be based on the predicted long term milk price, not on three month projections.

A cow is more efficient (needs less feed/BCS unit) when lactating than dry. Why do we need to dry-off to gain BCS?

Although there is evidence that lactating dairy cows require 20% less energy to gain a BCS unit than dry cows, genetic selection priorities over several decades have resulted in a cow that only reluctantly partitions energy to BCS gain in preference to milk production in mid and late lactation.

In addition, milking cows also require:

- Between 10 and 20 percent more energy for maintenance than dry cows
- Approximately 2.0 MJ for every km walked on the flat (approximately 8 MJ/day if the average paddock is 1 km from the shed and the cow is milked twice a day).

These additional requirements negate much, if not all, of the difference in energetic efficiency for BCS gain. In addition, lactating cows partition only a small proportion of available nutrients towards BCS gain.

Are some feeds more efficient than others at BCS gain?

Yes, there is a difference in the efficiency with which feeds are used for BCS gain, with recent research results suggesting that fat (e.g. PKE) may be used more efficiently than starch (e.g. maize silage) for BCS gain in dry pregnant cows.

I feed PKE and maize silage so don’t need to worry about BCS

Although high quality supplements are more efficient than autumn pasture for BCS gain in dry cows, allowing the cow sufficient time to achieve the BCS targets is also important.

If I use OAD in the autumn, how much supplement will I save?

OAD milking in the autumn has little impact on the farm’s total feed demand and is limited to the reduction in energy requirements associated with reduced walking distances and milk production. If feed supply is limited, culling cows and importing supplement will have a much larger impact on the farm’s feed supply. However, OAD is a good management option for cows to gain BCS in late lactation providing:

- OAD milking starts in early summer, as the expected BCS gain in reasonably well fed cows milked OAD is only 0.2 BCS units/month
- The OAD milked cows are well fed, grazing to the same residuals as twice-a-day (TAD) milked cows
- The herd has a bulk milk SCC that ensures continued grade-free supply.
What are the consequences of calving cows at BCS 4.5?

Cows calving at BCS 4.5 will produce less milksolids (~$34 milk revenue at $6.00/kg MS) and cycle three to four days later than they would had they calved at BCS 5.0. In addition, cows that calve at BCS 4.5 are more likely to be less than BCS 4.0 at mating and, therefore, have lower submission and conception rates.

There will always be a percentage of the cows that are not at BCS 5.0 at calving. The target is to have greater than 85% of the mature cows at BCS 5.0.

Is it true that regardless of how much the cows are fed, some cows will not gain weight and be BCS 4.0 at calving?

All cows will gain BCS providing they consume more energy than they require for maintenance and pregnancy. If the feed cows are fed is not sufficiently energy dense or if the cow has health problems that reduce dry matter intake, BCS gain will be limited.

Do I need to worry about the BCS of late calvers (after eight weeks) as they always end up in reasonable BCS when there is feed?

Late calving cows:
- Tend to calve in better condition as they have more time for BCS gain and
- Are less at risk of being underfed in the five to six weeks after calving; they are, therefore, less likely to lose more than 1.0 BCS unit after calving.

The priority, therefore, if feed is limited is to get:
- First calvers to BCS 5.5 by 22 months of age
- Early calving rising three-year-olds (second calvers) to BCS 5.5 one month before planned start of calving
- Early calving mixed age cows to BCS 5.0 one month before planned start of calving.

Why is BCS a priority when I can make more milk at a high stocking rate from thin cows?

At a high stocking rate, BCS is one factor that is not negotiable to ensure the system is sustainable. If cows calve at less than BCS 5.0, they are more likely to require interventions (induction and anoestrous treatments).

There is also a greater risk of high stocked farms contravening the Animal Welfare Act if they calve at a BCS less than 5.0 because of the greater likelihood of a feed deficit in poor springs.

I heard that if cows gain BCS quickly in autumn they lose it quickly in spring; is this true?

No, this is not true! The reason for the confusion is because people fail to account for the genetics of the cow.

Cows that have to gain BCS quickly in autumn are generally the thinnest cows. These cows are most likely to be thin because they are genetically driven to produce milk and, therefore, lose the most BCS in spring and do not gain BCS in mid-lactation. What is important is that cows get to BCS 5.0 and first and second calvers to 5.5 at calving. There are multiple ways to do this successfully. How fast cows gain BCS in autumn is not important.
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