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BODY CONDITION SCORING OF DAIRY COWS

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Introduction

Body condition score is an important management tool. The condition of the cow shows if the ration meets the need of the animal. A cow that is fed according to its needs functions optimally. Health problems can be encountered by animals that are too fat (especially at the end of lactation) or too skinny animals (especially at the beginning of lactation).

Body condition score is an indicator of how well the animal maintains energy reserves, reflective of the relationship between nutrition and milk production in a herd. But nowadays there is also more interest in body condition score (BCS) from the breeding side. BCS could be an indicator for robust cows. The breeding goal for dairy cows is actually selecting for a cow, which produces a lot of milk in an efficient way during a long time without problems. The actual direct selection for the past 20-25 years has been on milk production traits and conformation. Later on, longevity was added but a little attention was given to traits like fertility. This has changed the last couple of years. Now world wide, traits like fertility get more attention. One of the major challenges for good fertility in dairy cows is the negative energy balance during the first part of the lactation: the energy output, in production, is higher than the energy input, via feed intake, causing mobilisation of fat reserves. Solution for this disturbance is, or better attention for feeding during dry period and the beginning of the lactation, or genetic selection (de Jong & Hamoen, 2009).

BCS is a good indicator for cow's energy reserves during the lactation and could be a good measure for cow's which are able to balance in a good way between milk production and feed intake. Animals, which stay in good condition during the first part of the lactation, show shorter calving intervals. To get data for genetic selection herdbook organisations in several countries started to score cows for BCS. But to get extra value out of this data herdbook organisation could also think about scoring of BCS as an extra support or service for the farmer his management (de Jong & Hamoen, 2009).

The purpose of this booklet is to show how the simple technique of body condition scoring can contribute significantly to good husbandry and management of dairy cows. This will help to ensure that the cow is in the correct condition for each stage of her annual cycle and that appropriate dietary changes can be made in order to correct any deficiencies. For dairy cows the crucial periods are at calving and during early lactation. Achieving correct body condition at calving is important in order to avoid calving difficulties and losses. While in early lactation it is important to prevent excessive weight loss when meeting the extra nutritional demands of high yielding cows.

The technique links together three major factors:

- **Good Welfare**
- **Good Husbandry**
- **Good Performance**

Why Condition Score?

Condition scoring is a technique for assessing the condition of livestock at regular intervals. The purpose of condition scoring is to achieve a balance between economic feeding, good production and good welfare. Condition scoring is particularly useful as an aid to dry cow and pre-calving management. The objective is to ensure that cows calve down safely whether they are on a controlled diet indoors or outdoors at grass. Subsequently in early lactation the cow is under considerable nutritional pressure and body condition is a vital indicator of excessive weight loss. This can lead to metabolic disorders and other welfare problems and should be avoided.

Body condition score is a subjective assessment of the amount of fat, or stored energy a cows carries within her body. Scoring a cow requires only a simple visual assessment of certain parts of the cows where adipose tissues tend to accumulate. Body condition score has become a simple, yet powerful tool to adjust feeding and management practices:

- **to maximize milk production**
- **to minimize metabolic disorders in early lactation (ketosis, fatty cow syndrome)**
- **to minimize reproductive problems (avoid excess negative energy balance in early lactation).**

Most trial work on cow condition has had the objective of showing the ideal condition for maximum production e.g. linking condition at calving with milking potential or fertility, but equally important is establishing the correct score for **ease of calving**. (Body condition score and body weight effects on dystocia and stillbirths and consequent effects on postcalving performance (Berry et al., 2007)).

Importance of Body Condition

The important stages of production are:	
Pre-calving (drying off)	Condition should be “ fit not fat ”, and should be such to allow a moderate level of supplementation to prepare cows for early lactation.
At calving	Cows should not calve in an excessively fat condition. Fat cows may develop fatty liver disease or ketosis and are more prone to milk fever, mastitis, lameness and infertility (also retained placenta).
Early lactation	Dairy cows are under considerable nutritional stress and adequate feeding is essential to avoid excessive weight loss. Excessively thin cows can suffer discomfort in a housing environment such as cubicles.
At service	Dairy cows should not be in energy deficit by this stage as this may result in low fertility.

Source: DEFRA, 2001

Scoring Body Condition

The body condition score is an estimate of filling of cavity around tailhead with fat and fat covering of pelvic bones and rib bones.

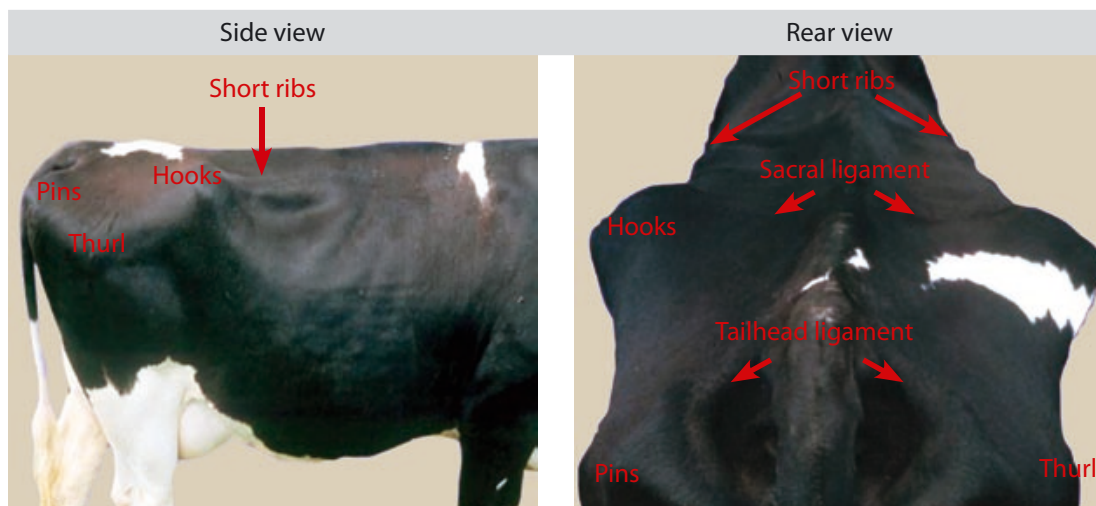


Image 1: Side View (Source: PennState, 2004)

Image 2: Rear View (Source: PennState, 2004)

For management purposes BCS is scored on a scale of 1 to 5 with 9 classes. European herdbook organisations have transformed this to the 1-9 scale, with the same 9 classes. The advantage of the 1-9 scale is that this scale is in line with the other linear scores.

There are multiple scales used across the world. In this book we use both notations.

Pictures of cows scoring 1, 5 and 9 **or 1, 3 and 5** are presented in Image 3a and 3b.

System: 1 to 9 scale

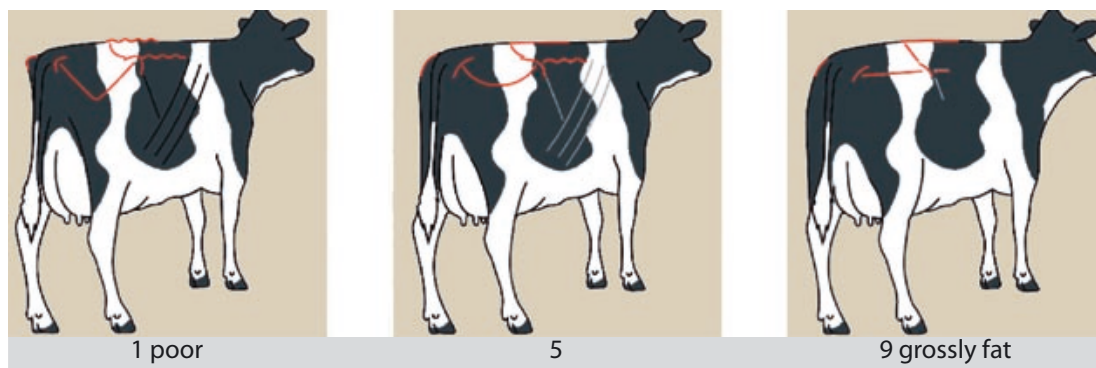


Image 3a: Three pictures of cows scoring **1, 5 or 9** for body condition (De Jong & Hamoen, 2009)

System: 1 to 5 scale

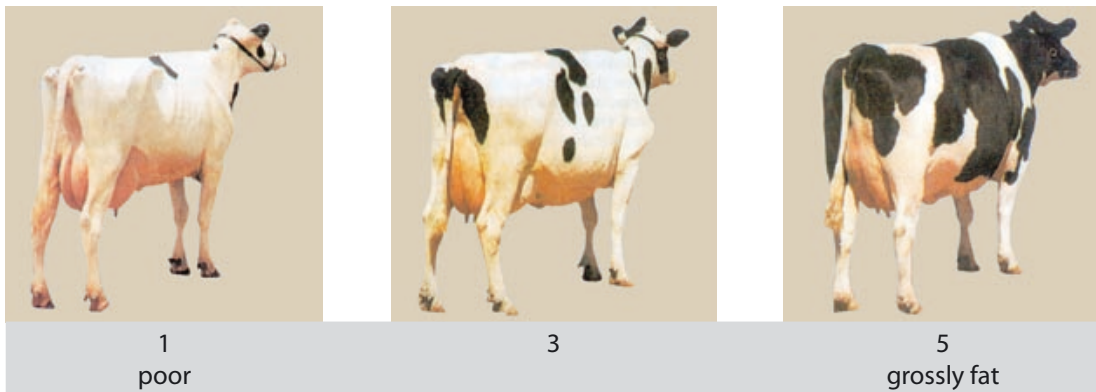


Image 3b: Three pictures of cows scoring **1, 3 or 5** for body condition (De Jong & Hamoen, 2009).

Body condition changes during the lactation. A cow starts in the beginning of the lactation with above average condition score and reaches on average the lowest point during the third month, after which the fat reserves increase again (see image 4).

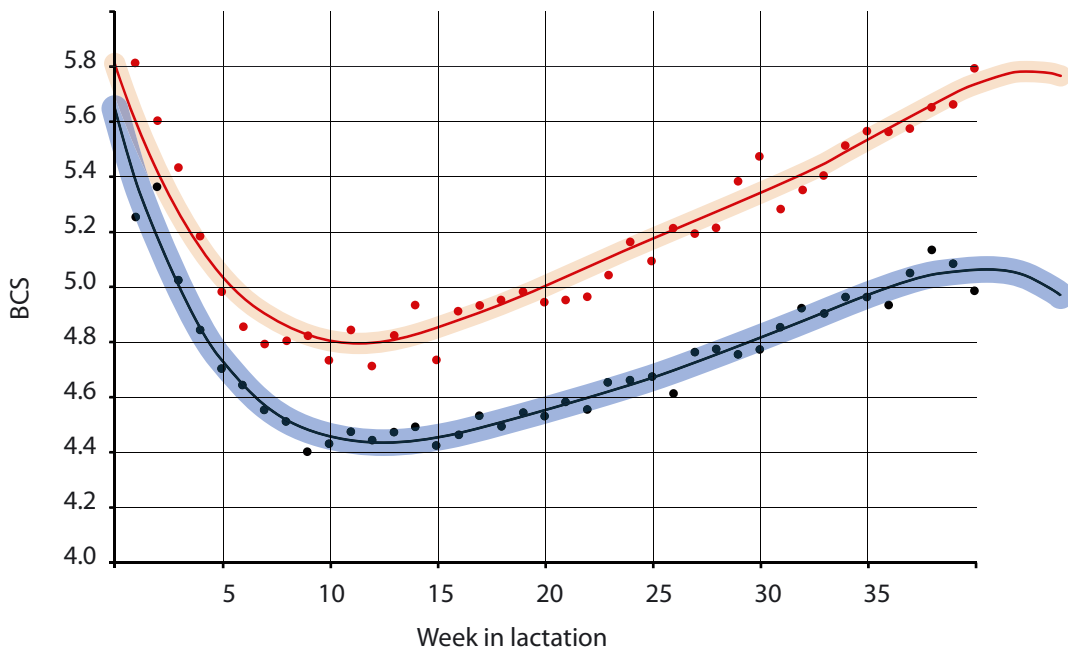


Image 4: *Body condition during the lactation for Black and White Holstein (blue line or lowest line) and Red and White Holstein (red line or highest line) in the Netherlands - on the scale 1 - 9* (De Jong & Hamoen, 2008)

Condition Scoring of Dairy Cows

In early lactation, high potential dairy cows frequently produce far more milk than can be supported by feed intake alone. They do this by drawing on body reserves that were built up before calving. This phenomenon is shown in Image 5 where the condition score decreases due to the withdrawal of body reserves.

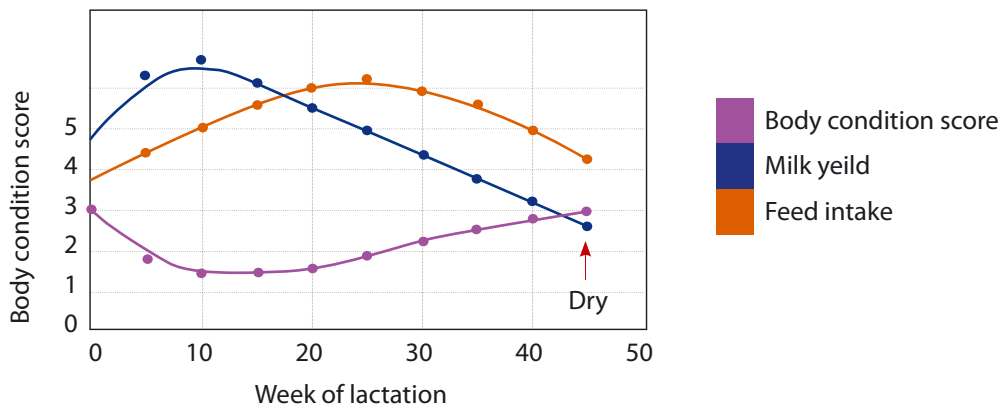


Image 5. **Relative changes in milk yield, feed intake and body condition score (on the scale 1 - 5) over the lactation**

Few farmers weigh their cows at regular intervals, and, even if they do, live-mass alone is not a good indicator of body reserves. Cows of similar mass could be small and fat, or large and thin. Similarly, cows could have the same body reserves and yet have very different masses. Live-mass is also affected by gut fill and by pregnancy. Body condition scoring is a technique for quickly and reliably estimating the body reserves of cows. These scores can then be used in making management decisions.

How to Body Condition Score

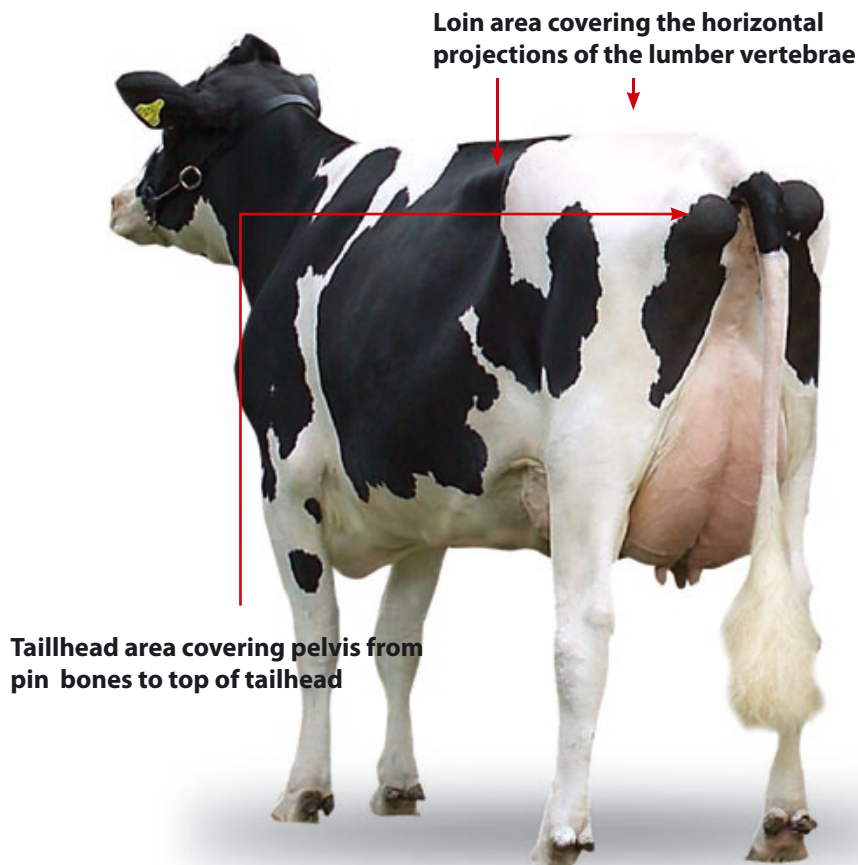
The local condition scoring technique is based on the method developed at the British National Institute of Research in Dairying (NIRD). Scoring consistently requires handling cattle in order to assess body reserves but an overall visual inspection is also important. Two score areas are involved namely the loin area and the tailhead area subjectively, by feeling with the hand the amount of fat cover over the transverse processes (horizontal projections) of the lumbar vertebrae, and around the tailhead. You should stand directly behind the cow to score both areas and always handle the animal quietly and carefully using the same hand. The tailhead is scored by feeling for the amount of fat around the tailhead and the prominence of the pelvic bones. The loin is scored by feeling the horizontal and vertical projections of the vertebrae and the amount of fat in-between.

The cow is awarded a condition score on a scale of 1 (very poor) to 5 (grossly fat), with half scores to give a 9-point scale or on a scale of 1 (extremely thin) to 9 (extremely fat), with 9-point scale. Consistency in the technique is the key to good condition scoring (DEFRA, 2001).

Scoring Method

- Score the tailhead area by feeling the amount of fatness. This gives a better estimate than visual inspection alone because of the set of tailhead and thickness of coat.
- Score the loin area in a similar way, using the same hand, when the cow is relaxed.
- Assess the scores to the nearest half point on 5-point scale or one point on 9-point scale. Cows must be handled for accurate assessment of half points on 5-point scale or of one points on 9-point scale.

Image 6. ***The two score areas***



Get together at regular intervals, at least twice a year, with other condition scorers to revise technique and scores. Good stockmen who like their cows tend to over score. Experience has shown that people who work in isolation with only one herd tend to drift away from the definitions. For example, if that herd is generally a bit thin, and has few or no cows with condition scores greater than 2,5, the 2,5's will inevitably become 3's and so on. Regular comparison with friends and colleagues is essential (van der Merwe B.J. & P. G. Stewart, 2010).

Description of Scores

The following is a step by step guide to help you learn to assign body condition scores (BCS) based on the process described by Ferguson *et al.*, 1994.

What to look for when body condition scoring a dairy cow?

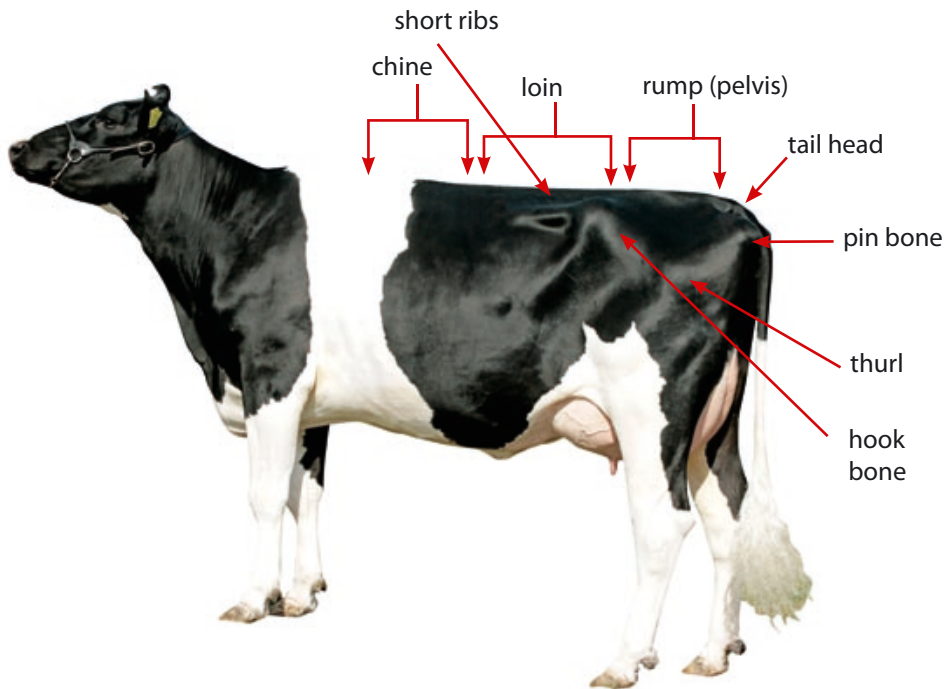
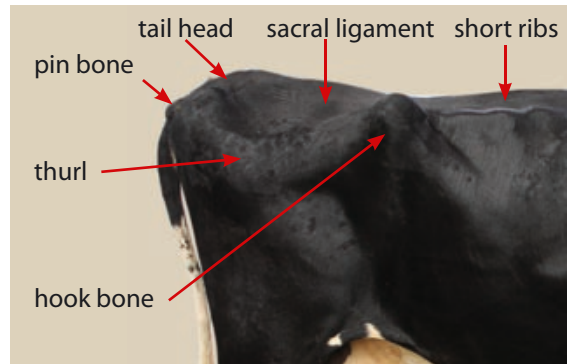
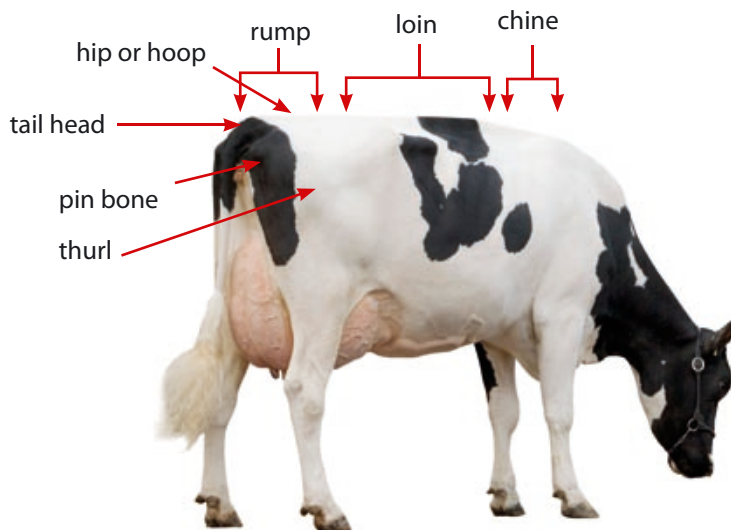


Image 7. **Parts of a dairy cow used to score** (Neary & Yager, 2002; Michel, 2008; Agric, 2010)

Scorers using this method will be able to assign BCS consistently and accurately. This system will teach you to evaluate specific areas of the pelvis and loin in an orderly fashion. Scores range from 1 to 9 or from 1 to 5 in increments of 0.5. This system concentrates on accurately assigning scores from 4 to 7 on 9-point scale or from 2.5 to 4.0 on 5-point scale. Scores outside of this range are extreme and indicate serious problems. For example, on 9-point scale the difference between an 8.5 and a 9.0 is insignificant, both cows are seriously over-conditioned and prone to the same metabolic problems. The same is probably true of two cows scoring 2.0 and 2.5; both are seriously under-conditioned. Even with a structured system such as this, some cows will fall between the categories described. In this case, scorers must decide which score best fits each cow. As you assign scores, it may be helpful to continue one step past the score you think the cow should receive. This allows you a second opportunity to consider her final BCS. For dairy cows, BCS are based on evaluation of the pelvic area and the loin.

How to Evaluate Body Condition



Using method: 9-point scale (adapted from Ferguson *et al.*, 1994)

Step 1: Angle between Hooks and Pins

- The first decision you make will divide cows into two groups: those with a BCS less than or equal to 5 and those with a BCS greater than 5.
- From the side view, evaluate the angle between the hooks and pins, using the thurl as a reference point



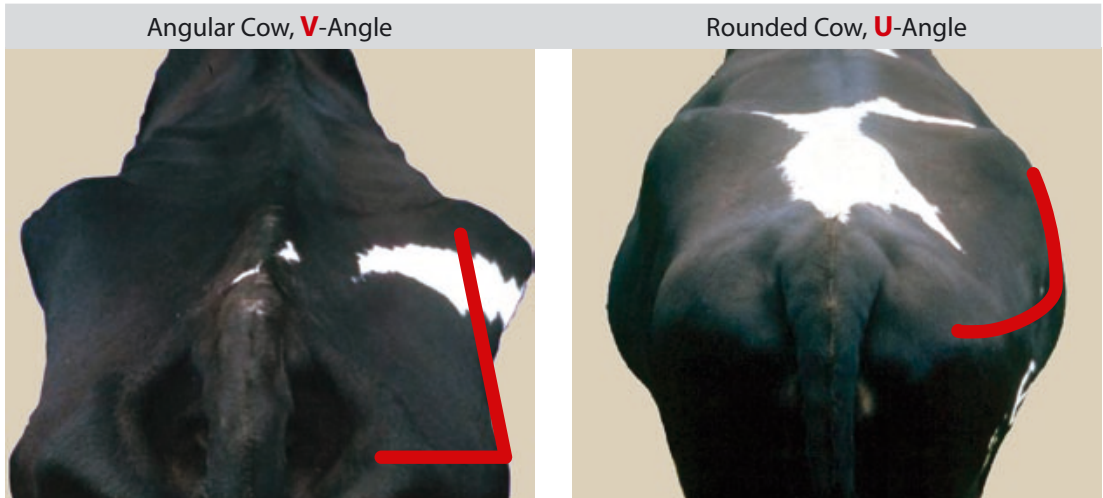
- Angle is a **V**
- BSC will be a 5 or less



- Angle is a **U**
- BCS will be more than 5

Source: <http://www.das.psu.edu/research-extension/dairy/nutrition/ppt/>

This decision may be the most difficult one in the BCS process, especially if the cow is near a 5.0 or 5.5 BCS. If the difference between a **U** and a **V** is not clear, move to the rear and observe the same angle between the hooks and pins. In addition, evaluate the angularity of the hooks and pins. Cows with sharp, angular hooks and pins will likely score 5 or less. Cows with round, fat-covered hooks and pins will likely score above 5.

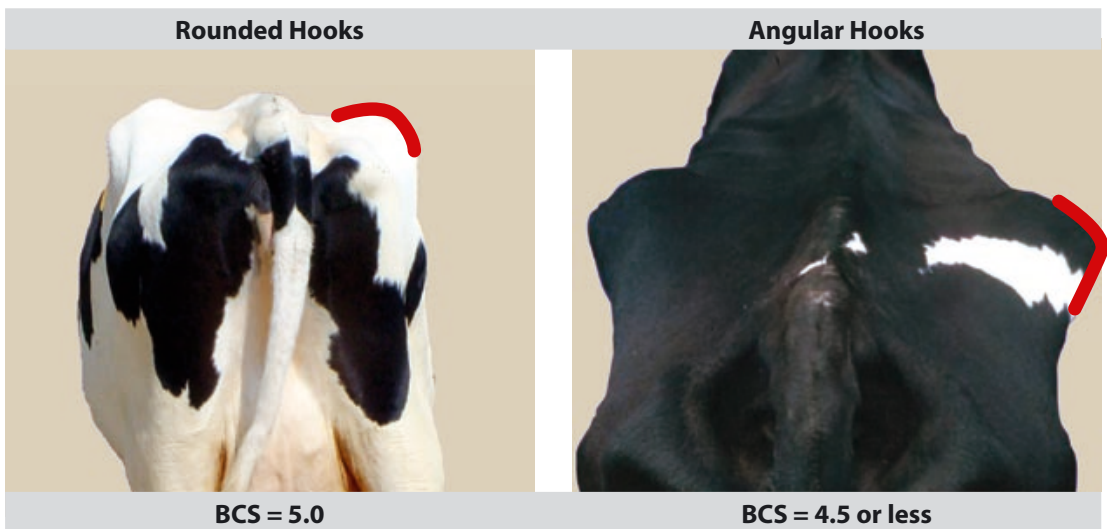


More Practice

- Since this first decision can be a little difficult, here are a few more examples.
- Once you have looked at each cow, you can advance to see the answer.

Cows with **V**-Angle – 5.0 or less

- Now let's refine your score of »5 or less,« starting with an evaluation of the **hooks**.
- Are they round or angular?



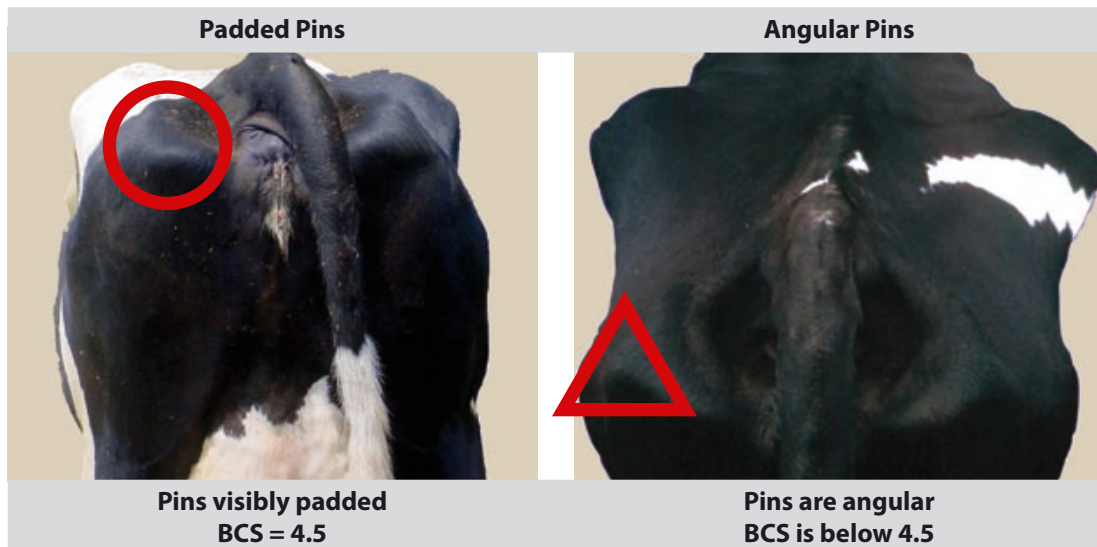
Source: <http://www.das.psu.edu/research-extension/dairy/nutrition/ppt/>

Check Point

- If these steps don't seem to fit the cow you are scoring, try going through the steps for cows with a **U-angle** between the hooks and pins.

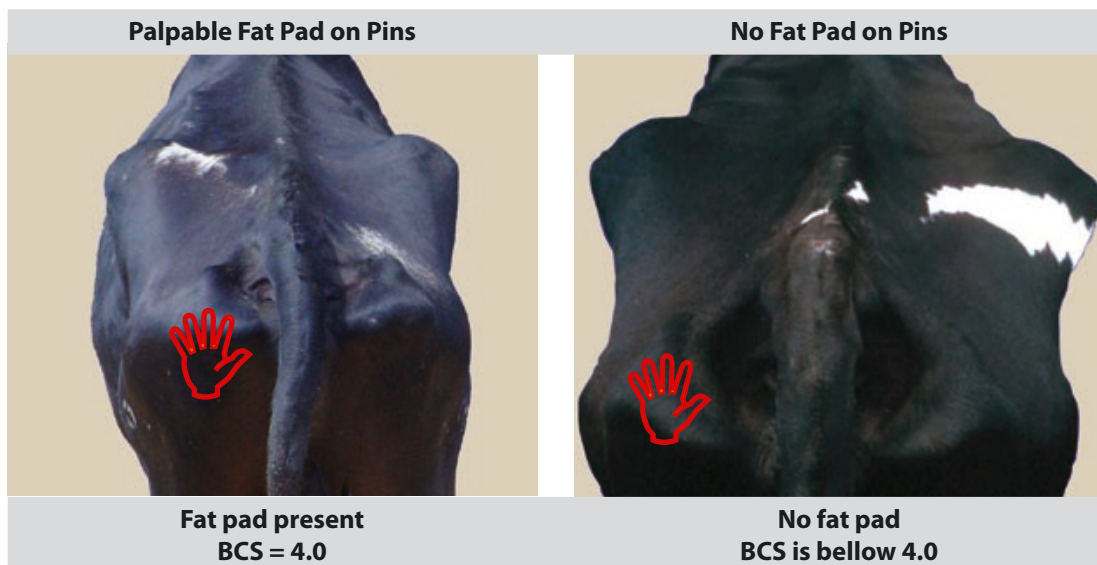
Cows with Angular Hooks – 4.5 or less

- Now let's refine your score of »4.5 or less,« by evaluating the **pins**.
- Are they padded or angular?



Feel Pins for Fat Pad

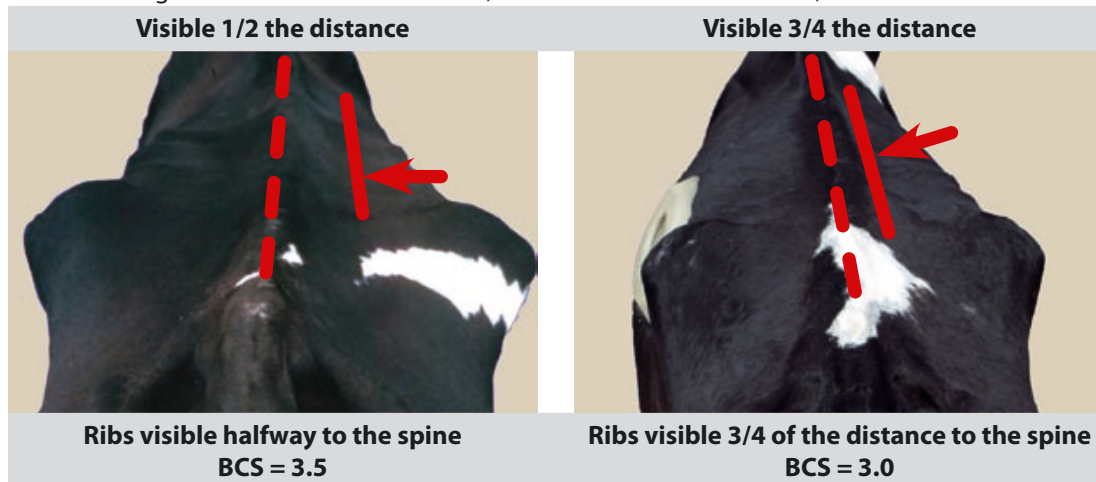
- Now let's refine your score of »less than 4.5« by evaluating the **pins** more closely.
- Can you feel a fat pad on the point of the pins (a palpable fat pad)?



Source: <http://www.das.psu.edu/research-extension/dairy/nutrition/ppt/>

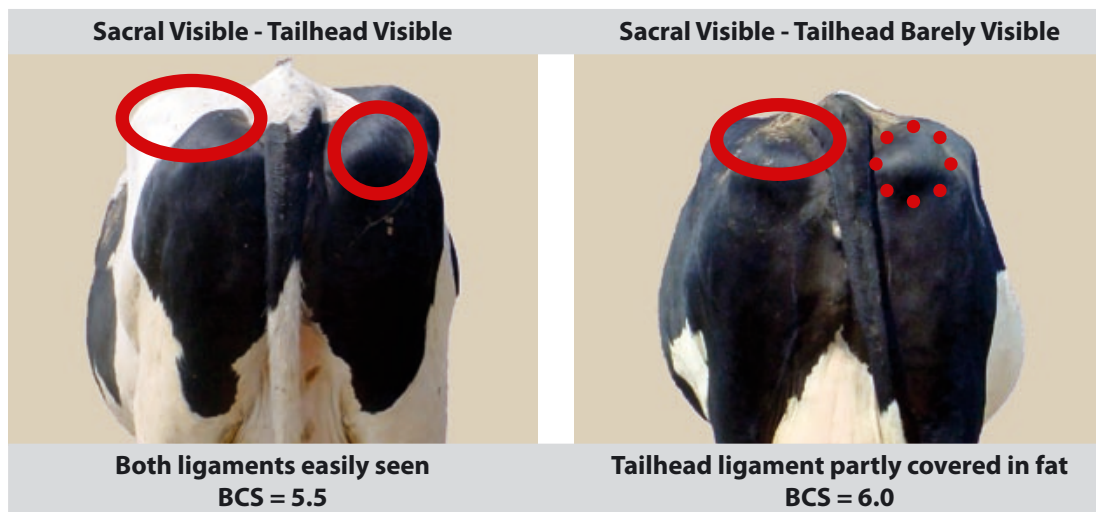
Evaluate the Visibility of Short Ribs

- The final decision to refine your score of »less than 4« requires a close look at the **short ribs** and **spine**.
- Look for the boney ridges of the short ribs.
- Estimate the distance that these ridges are easily seen from the tip of the short ribs to the spine.
- Are the ridges visible half of the distance, three-fourths of the distance, more?



Cows with a U-Angle – Score over 5

- Now let's refine your score of »over 5« starting with an evaluation of the **tailhead** and **sacral ligaments**.
- The tailhead ligament is found between the tailhead and the pins.
- The sacral ligament is found between the spine and the hooks.
- The visibility of these ligaments will help you score cows with more condition.
- Which ligaments can you see?



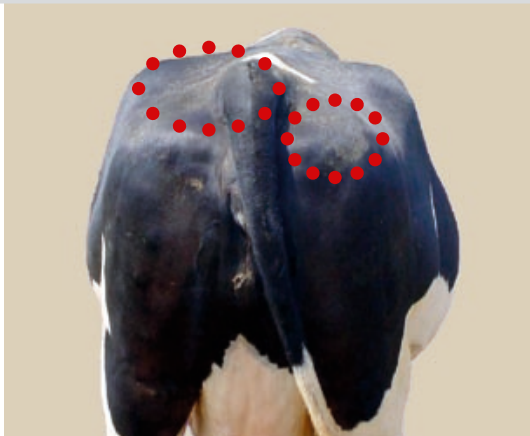
Source: <http://www.das.psu.edu/research-extension/dairy/nutrition/ppt/>

Sacral barely visible - Tailhead not visible



**Neither ligament easily seen
BCS = 6.5**

Sacral not visible - Tailhead not visible



**Neither ligament visible
BCS = 7.0 or more**

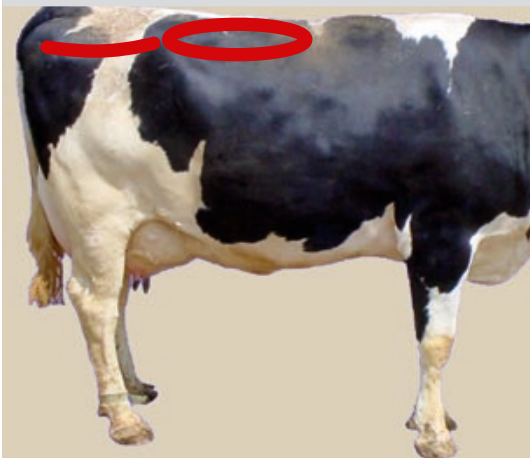
Check Point

- If none of these descriptions fit the cow you are scoring, try going through the steps for cows with a **V-angle** between the **hooks** and **pins**.

Scores Greater than 7.0

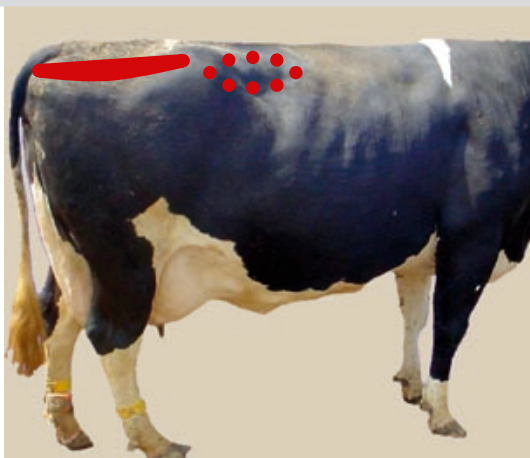
- Now let's refine your score of »over 4,« by evaluating the **thurl**, **short ribs**, **pins**, and **hooks**.
- The score will increase as more of these parts are covered with fat.
- Which parts can you see?

Thurl Flat - Short Ribs Visible



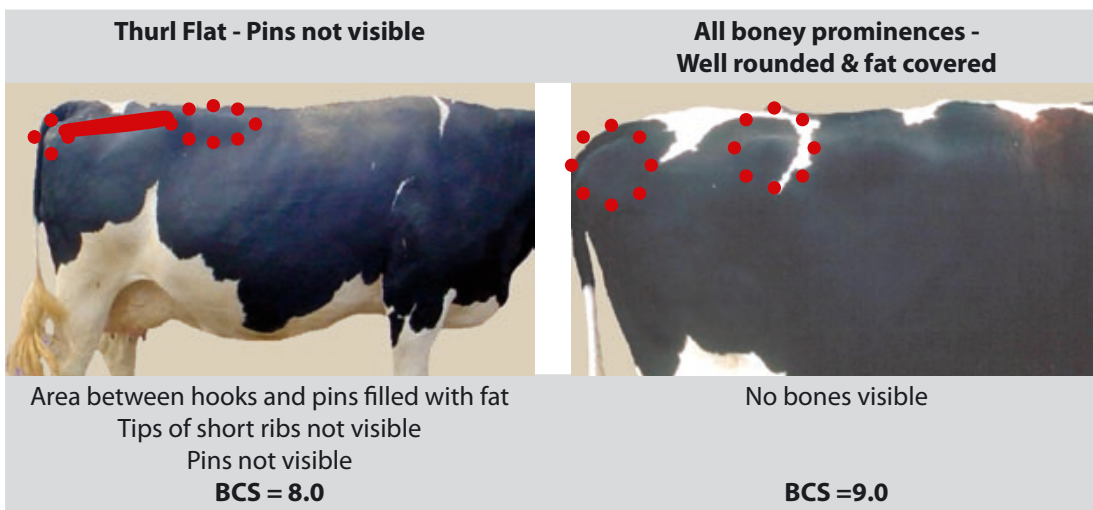
**Area between hooks and pins filled with fat
Tips of short ribs visible
BCS = 7.0**

Thurl Flat - Short Ribs Barely Visible







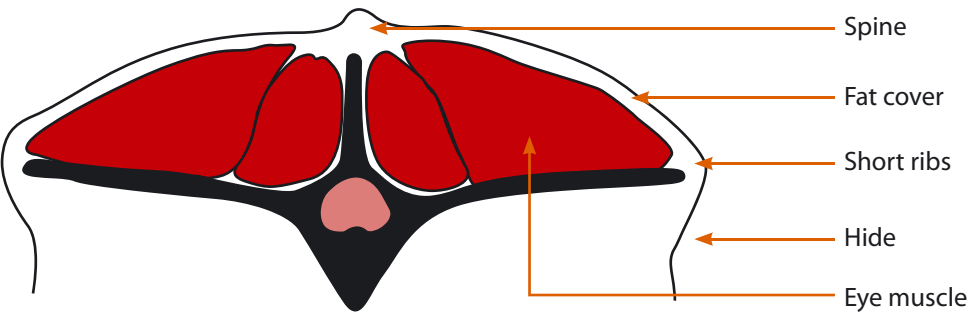
**Area between hooks and pins filled with fat
Tips of short ribs barely visible
BCS = 7.5**

Source: <http://www.das.psu.edu/research-extension/dairy/nutrition/ppt/>







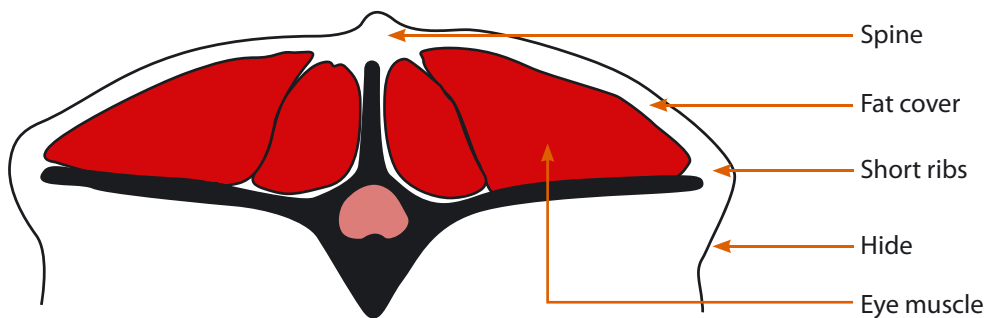
Specification of Scores

Score	Condition	Detailed description	Visual guide
1	Poor	Tail head – deep cavity with no fatty tissue under skin. Skin fairly supple but coat condition often rough.	
		Loin – spine prominent and horizontal processes sharp.	
<ul style="list-style-type: none">Individual short ribs have a thin covering of flesh.Bones of the chine, loin, and rump regions are prominent.Hook and pin bones protrude sharply, with a very thin covering of flesh and deep depressions between bones.Deep cavity under tail and around tail head (between pin bones).Bony structure protrudes sharply, and ligaments and vulva are prominent. <p>SHORT RIBS: The ends of the short ribs are sharp to the touch and together give a prominent shelf-like appearance to the loin. Scalloping over the top and ends of the short ribs is very obvious.</p> <p>BACKBONE: the vertebrae in the chine, loin and rump area are prominent and easily seen as individual bones.</p> <p>HOOK AND PIN BONES: the hook and pin bones are sharply defined and very angular in appearance with no discernable fat pad.</p> <p>THURL: the area over the pelvis, between the hook and pin bones, forms a severe “V shaped” depression without fat cover</p> <p>TAIL HEAD: the area on either side of the tail head is sunken and hollow with obvious folds of skin. The ligaments connecting the pin bones to the spine are sharply defined. The vulva is prominent. Source: DEFRA, 2001</p>			
			






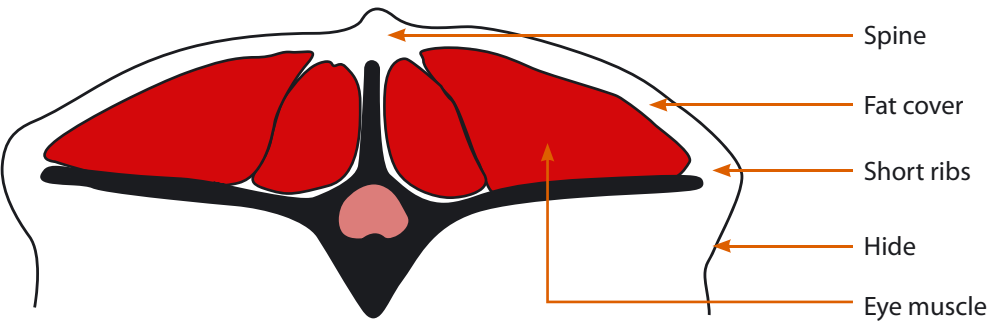
Cross - section, score 1

Score	Condition	Detailed description	Visual guide
3	Moderate	Tail head – shallow cavity but pin bones prominent; some fat under skin. Skin supple.	
		Loin – horizontal processes can be identified individually with ends rounded.	
<ul style="list-style-type: none"> Individual short ribs can be felt but are not prominent. Ends of ribs are sharp to the touch but have a thicker covering of flesh. Short ribs do not have as distinct an »overhanging shelf« effect. Individual bones in the chine, loin, and rump regions are not visually distinct but are easily distinguished by touch. Hook and pin bones are prominent, but the depression between them is less severe. Area below tail head and between pin bones is somewhat depressed, but the bony structure has some covering of flesh 			
<p>SHORT RIBS: The ends of the short ribs can be felt but are not as prominent as in condition score 1 cows. The edges of the short ribs can be easily felt but have a slight amount of fat cover giving them a slightly more rounded appearance. The over hanging shelf effect is less apparent.</p> <p>BACKBONE: the vertebrae in the chine, loin and rump area are less visually distinct but are easily felt.</p> <p>HOOK AND PIN BONES: the hook and pin bones are still prominent, angular with no fat pad palpable.</p> <p>THURL: the area over the pelvis forms a less severe but still “V shaped” depression with little tissue cover</p> <p>TAIL HEAD: the area on either side of the tail head is sunken and hollow. The ligaments connecting the pin bones to the spine are sharply defined.</p> <p>Source: DEFRA, 2001</p>			






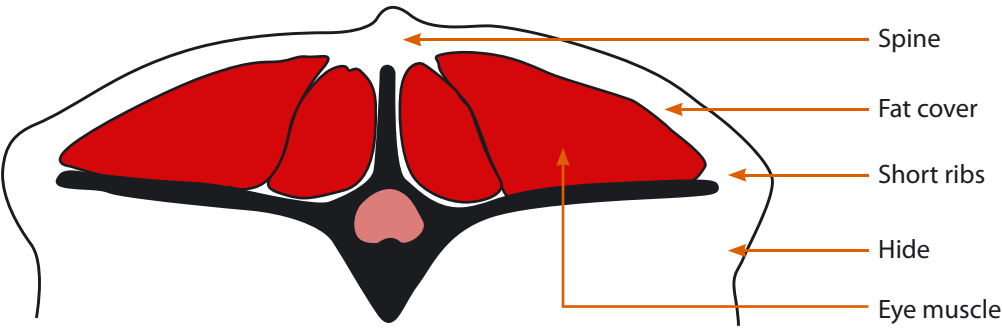
Cross - section, score 3

Score	Condition	Detailed Description	Visual Guide
5	Good	Tail head – fat cover over whole area and skin smooth but pelvis can be felt.	
		Loin – end of horizontal process can only be felt with pressure; only slight depression in loin.	
<ul style="list-style-type: none"> Ends of short ribs can be felt by applying slight pressure. Short ribs appear smooth and the overhanging shelf effect is not so noticeable. The backbone appears as a rounded ridge; firm pressure is necessary to feel individual bones. Hook and pin bones are rounded and smooth. Area between pin bones and around tail head appears smooth, without signs of fat deposit. <p>SHORT RIBS: The ends of the short ribs can be felt with moderate pressure. Taken together, the short ribs appear smooth without noticeable scalloping. The over hanging shelf effect is much less apparent.</p> <p>BACKBONE: the vertebrae in the chine, loin and rump area appear rounded. The backbone can still be seen but the individual vertebrae are not distinct.</p> <p>HOOK AND PIN BONES: the hook and pin bones can be easily seen but are smooth with a more rounded appearance with some palpable fat pad.</p> <p>THURL: the area over the pelvis forms more of a “U shaped” depression.</p> <p>TAIL HEAD: the area on either side of the tail head is somewhat hollow but the folds of skin are not distinct. The ligaments connecting the pin bones to the spine are more rounded in appearance. Source: DEFRA, 2001</p>			




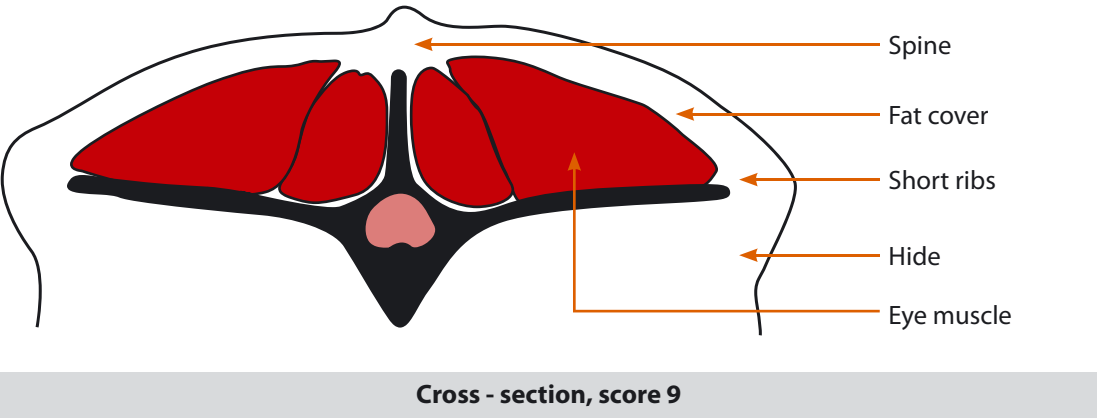
Cross - section, score 5

Score	Condition	Detailed Description	Visual Guide
7	Fat	Tail head – completely filled and folds and patches of fat evident.	
		Loin – cannot feel processes and will have completely rounded appearance.	
<ul style="list-style-type: none"> Individual short ribs are distinguishable only by firm palpation. Short ribs appear flat or rounded, with no overhanging shelf effect. Ridge formed by backbone in chine region is rounded and smooth. Loin and rump regions appear flat. Hooks are rounded and the span between them is flat. Area of tail head and pin bones is rounded, with evidence of fat deposit. <p>SHORT RIBS: The ends of the short ribs cannot be seen as individual bones and can only be felt with firm pressure. The over hanging shelf effect is slight and is just visible.</p> <p>BACKBONE: the vertebrae in the chine rounded and smooth. The area over the loin and rump appear flat.</p> <p>HOOK AND PIN BONES: the hook and pin bones are rounded with an obvious fat covering.</p> <p>THURL: the area over the pelvis, between the hooks and pins is almost flat. The pelvic bone can be felt only with firm pressure.</p> <p>TAIL HEAD: the area on either side of the tail head is not hollow and there are no skin folds. Some fat deposit can be felt. Source: DEFRA, 2001</p>			



Cross - section, score 7

Score	Condition	Detailed Description	Visual Guide
9	Grossly Fat	Tail head – buried in fatty tissue, pelvis impalpable even with firm pressure.	
<ul style="list-style-type: none">Bony structures of backbone, short ribs, and hook and pin bones are not apparent; subcutaneous fat deposit very evident.Tail head appears to be buried in fatty tissue.			
<p>SHORT RIBS: The ends of the short ribs cannot be seen or felt. There is no overhanging shelf.</p> <p>BACKBONE: the vertebrae in the chine loin and rump cannot be seen and only felt with difficulty.</p> <p>HOOK AND PIN BONES: the hook and pin bones are very round and buried in fatty tissue, almost disappearing.</p> <p>THURL: the area over the pelvis, between the hooks and pins has filled in and appears to be flat. Source: DEFRA, 2001</p> <p>TAIL HEAD: the hollow is filled in and the area on</p>			



Explanation of Scores

Body Condition Score = 2.0

This cow is too thin and is hopefully rarely seen on a farm. This cow will not milk well or reproduce. This cow probably isn't healthy. The vertebrae, short ribs, hooks, pins, and tail head are very sharp and visible. One-half of the length of the transverse processes is visible. The ligaments are easily seen and the thurl area is very dished. The area around the tail head is very dished and there are folds of skin seen between the tail head and pins.

Body Condition Score = 3.0

This cow is very thin, causing low milk production and poor reproduction. Health may be O.K. The spine and short ribs can be easily seen, but the individual vertebrae are not real apparent. The short ribs appear scalloped. The upper surfaces of the short ribs can be felt. One-half to 1/3 of the length of the transverse processes is visible. The hooks and pins stand out and the thurl area is very dished. No fat can be felt on the pin bones. The ligaments are sharp and easily seen. The area around the tail head is very dished and there are folds of skin seen between the tail head and pins.

Body Condition Score = 4.0

It is a reasonable goal not to have more than 10% of the herd scoring 2.5 or less. This is the lowest acceptable condition score. A cow with a score of 2.5 has vertebrae showing but they cannot be seen as individual bones. The short ribs can be counted but are not scalloped. One-third to ¼ of the length of the transverse processes is visible. The ligaments are easily seen but not as sharp as with a BCS of 2.0. Both the hooks and pins are angular but some fat can be felt on the pin. The thurl area is dished. The area around the tail head is dished.

Body Condition Score = 5.0

This cow could be a healthy, high-producing cow. But, if a cow calves in at a score of 3.0 or less, she may not have enough body fat to use for high peak milk production and to carry her through until dry matter intake increases. At this score the dish of the rump (thurl area) is at the transition between looking like a **“U”** and looking like a **“V”**. Any cow under a BCS of 3.0 has a thurl area which looks like a **“V”**. The backbone is seen but the individual vertebrae are rounded. Covering the short ribs is ½ to 1-inch of flesh. Less than ¼ of the length of the transverse processes is visible. There is fat covering the ligaments but they are still obvious. The hooks and pins have some fat that can be felt. The area around the tail head is dished but no folds of skin are seen.

Body Condition Score = 6.0

Dry cows and calving cows should have a body condition score of 3.5. On this cow, fat can be felt on the backbone, short ribs, and ligaments. The hooks and pins are rounded. No individual transverse processes can be seen. The thurl is somewhat dished. The coccygeal (tail head) ligament is barely visible but the sacral ligament can still be seen. The area around the tail head is rounded and filled in but not fat.

Body Condition Score = 7.0

Cows calving in at this condition will eat less, lose more weight, and have more metabolic problems. This cow's back is flat because of the fat that has filled in. The short ribs cannot be seen as individuals but they can just barely be felt. The hooks and pins are obviously fat. The **“U”** between the hooks and pins is very flat with no depression. The ligaments cannot be seen. The area around the tail head is filled in and folds of fat are seen.

Body Condition Score = 9.0

This cow is extremely fat and will have metabolic and breeding problems. The backbone and short ribs cannot be seen and are hard to feel. The hooks and pins are buried in fat and hard to feel. The thurl is totally filled in. The tail head is buried in fat. (Source: DeLaval, 2008)

BCS and Management

BCS has relationship with many traits, which are important to a dairy farmer. Cows, which score in the extreme classes, so too fat or too thin, are culled earlier during her life. Further cows, which produce 1.000 kg milk more, the BCS is 0.5 point lower. The relation with fertility is one of the most interesting. Cows with one point higher BCS have a 5-day shorter interval calving to first insemination and a 5-day shorter calving interval.

BCS and Milk Production

Body condition score is a critical measure of a dairy feeding system's effectiveness (Grant & Keown, 1993). Adequate body fat reserves promote milk production, reproductive efficiency and herd longevity. Excessively fat cows or overly thin cows run much greater risks of metabolic problems, lower milk yield, poor conception rates and dystocia (difficulty calving). Failure to attain proper body condition or rapid changes in body condition score during early lactation may indicate problems in herd health or feeding management. Condition score should be monitored at each reproductive examination, including:

- At calving,
- Postpartum examinations,
- Breeding,
- Pregnancy checking,
- Late lactation (about 250 days in milk), and
- At dry-off.

The modern dairy cow cannot consume enough feed in early lactation to provide her with enough energy to meet her needs for maintenance and milk production. Under these circumstances, the cow mobilizes body fat to be used to supply the needed energy and as a result, loses body condition.

During a normal lactation cycle (the period of time between two consecutive calving), cows undergo changes in their body conditions. In early lactation a cow loses adipose (fat) tissues that supply a substantial amount of energy. Here is a short list of practical facts that research has helped us discover:

- Cows mobilized adipose tissues from a few days before calving until approximately 8-10 weeks after calving
- During this early lactation period a cow may lose from 0.5 to 1.0 kg of body weight per day
- One kg of body weight mobilized (i.e., lost), provides a amount of energy equivalent to the production of approximately 7 kg of milk
- In mid to late lactation cows recover the body condition lost in early lactation more slowly (0.25 to 0.5 kg/day) and over a longer period of time (from week 10 to 40 or whenever the lactation ends).

The information collected when scoring cows help us determine whether the feeding program of groups of cows within a herd need to be adjusted or not. Are cows in early lactation losing too much »weight« too fast? or may be cows in mid and late lactation tend to become too fat.

Impact of Body Condition Score at Calving

Cows in body condition score BCS 5 (on the scale 1 = emaciated to 9 = obese; Herd & Sprott, 1986) or better at calving have fewer days to first estrus and increased pregnancy rates (Rasby *et al.*, 1981, Wettemann *et al.*, 1981). Cows calving in BCS less than or equal to 4 had a 9 % to 29 % lower pregnancy rate compared to cows calving at BCS greater than or equal to 5 (Makarechain & Arthur, 1990). Research from Oklahoma indicates that changes in BCS between 4 and 6 have a greater impact on pregnancy rate than changes in BCS above 6 or below 4 (Selk *et al.*, 1988). In other words, little improvement in pregnancy rates is seen when cows calve in BCS above 6 while pregnancy rate does not get much worse below BCS 4.

Changes in body condition score during lactation

Production efficiency of a lactating cow refers to her ability to partition energy intake as effectively and efficiently as possible into milk production. The energy demand for yield typically exceeds energy derived from intake in the early stage of a lactation resulting in a period of negative energy balance (EB). Higher-producing cows express more severe prolonged negative EB, thereby resulting in greater biological stress (Berry *et al.*, 2002). This stress may impact upon the reproduction and immune systems leading to fertility and health problems during and beyond the negative EB period (Collard *et al.*, 2000). During the negative EB period, lactating dairy cows typically mobilize body reserves to meet the energy demand for yield. The depletion of body reserves is indicative of the severity of negative EB, but body reserves of a living lactating cow are impossible to measure directly. Like milk yield and dietary intake, which are functions of amount and composition, body reserves are a function of weight and composition. Weight can be easily measured, but body composition of a lactating cow can only be approximated. Body condition score (BCS) has been proposed to approximate the body composition of a dairy cow. Among others, Edmonson *et al.* (1989) and Ferguson *et al.* (1994) indicated that not only is BCS a good measure of total body fat, but also the method is accurate and repeatable between assessors of body condition.

Early lactation

We know that a significant amount of the energy a high-producing cow uses to make milk in early lactation comes from her body fat reserves. Weight losses of one to one and a-half kilograms per day, are not uncommon during the first 100 days in milk. Fortyfive grams of mobilised fat can support about three kilograms of milk. Many herds will average 1.0 body condition loss by 30 days in milk. A good goal is not to exceed 1.0 body condition loss during that time. It is critical that cows do not exceed one point of body condition loss by 30 days in milk. Cows with excessive body condition losses will have irregular heats, longer time to first ovulation and may fail to conceive. These cows will also be less persistent in milk production. Cows with a BCS over 6.5 at two weeks prior to calving are more prone to having depressed intakes, weight loss, fatty liver, ketosis, high non-esterified fatty acid (NEFA) levels, calving and reproductive problems. When a cow loses body fat reserves, especially two weeks before and after calving, the liver takes up fat and processes it. Fatty liver and ketosis can then develop. Cows that had a BCS of 7.0 or greater at dry off were 2.5 times more likely to have

reproductive problems. Even if one could avoid the health and reproductive problems associated with fat cows, it is inefficient to put excessive weight on (>6.5 BCS) during late lactation and the dry period, then have to take it off after calving. It takes energy for the cow to process body fat and then to mobilise it for later use (DeLaval, 2008).

Body condition score, energy balance and milk production

High-producing dairy cows simply cannot consume enough feed during the first 60 to 90 days of lactation to support high milk yields and avoid weight loss. Body fat must be mobilized to support high milk production. Energy balance is the difference between intake of feed energy and energy output in the milk. Energy balance is related to body condition loss or gain. Maximum negative energy balance occurs within two to three weeks after calving, and cows may reach positive energy balance by approximately 60 days in milk. A primary goal is to manage the feeding program to properly manipulate body condition loss and minimize the duration of negative energy balance. High milk yield does not cause excessive weight loss if the feeding program is well-tuned. Two or three times daily milking does not alter target body condition scores.

Nutrition and body condition score

British research indicates cows that are fat at calving (condition score 7 to 9 on 9-point scale or 4 to 5 on 5-point scale) experience a longer delay between peak milk yield and peak intake, prolonging negative energy balance. On the other hand, less conditioned cows at calving (condition score **3** (1-5) or **5** (1-9)) have higher feed intake that more closely coincides with peak milk yield. Overly fat cows (condition score **7** to **9** (1-9) or **4** to **5** (1-5)) at calving typically lose body condition, while cows closer to condition score **3** (1-5) or **5** (1-9) at calving gain body condition. Body fat appears to inhibit feed intake, so cows fat at calving cannot reach maximum feed intake until they lose some of the excess conditioning. Cows may have a »target body condition« in early lactation, which they try to reach if diets are properly formulated. The ideal, or target, body condition score is probably lower for genetically superior, highproducing dairy cows.

Feeding guidelines for proper body condition during lactation

When troubleshooting reasons for poor body condition, consider feet and leg problems, overall herd health and feeding management. Any health problem that limits a cow's movement to the feed bunk or her ability to aggressively consume feed will likely limit intake and the ability to maintain proper body condition and milk production. The major aspects of feeding management that can be adjusted to control body condition include:

- Maximizing feed intake,
- Adjusting energy concentration,
- Adjusting crude and escape protein levels,
- Providing adequate fiber to prevent off-feed problems or chronic intake fluctuations, and
- Checking macro mineral (Ca, P, Mg and K) levels and water availability.

A major goal of proper feeding is to maximize feed intake during early lactation. The sooner

a cow reaches high levels of feed intake, the sooner she moves out of negative energy balance. Consequently, reproductive performance improves and milk production is greater. Diets that contain adequate fiber help prevent low intake and chronic intake fluctuations, poor body condition scores and erratic and low milk production. Diets should always be properly formulated to meet energy and protein requirements for high levels of milk production.

Generally, when high energy diets are fed to fully meet the cow's requirements, both fat and thin cows produce more milk compared to when energy is limiting. Adequate dietary energy should come from high quality forages, grains or supplemental fats. The trick is to meet the cow's energy requirement without feeding excessive grain or fat causing acidosis, metabolic disorders or off-feed problems. Diets formulated to contain proper levels of crude protein and escape protein promote highest milk yields and optimum condition scores. Overly fat cows in early lactation especially respond to proper escape protein levels. Proper ration formulation includes adjusting the ration before body condition losses become great and persistency of lactation or reproductive efficiency are hurt. Large changes in condition score are stressful, lower appetite and may cause ketosis and fatty livers. The following sections detail specific parts of the feeding program to evaluate during each stage of lactation if poor body condition is a problem in the herd.

Body condition by stage of lactation

Fresh cows (0 to 4 weeks after calving)

Remember that cows should calve at condition score **3.0 to 3.5** (5-point scale) or **5.0 to 6.0** (9-point scale). By four weeks they should not have fallen below **3.0 to 2.5** (5-point scale) or below **5.0 to 4.0** (9-point scale) (very high producing cows may drop to **2.0** (5-point scale) or to **3.0** (9-point scale)). If rapid loss of body condition occurs during the first four weeks, and the cow is otherwise healthy, examine intake, dietary energy and protein, fiber adequacy, and feeding strategy.

Early lactation (1 to 4 months)

Recommended score is **2.5 to 3.0** (5-point scale) or **4.0 to 5.0** (5-point scale). Try to maintain cows in the condition score **3** (5-point scale) or **5** (9-point scale) range and allow the cow to regain positive energy balance. If many cows fall to condition score **2** (5-point scale) or **3** (9-point scale), especially if they are not high producers, check feed intake. Remember that high levels of milk production and good body condition can only be achieved when feed intake is maximized. If cows remain in good condition (**3 to 3.5** on (5-point scale) or **5 to 6** (9-point scale)), but do not peak very high, check for inadequate protein, macro minerals or water intake.

Mid-lactation (4 to 8 months)

Recommended score is approximately **3** (5-point scale) or **5** (9-point scale). The nutritional objective is to meet or slightly exceed energy requirements so body reserves can be built-up. If cows become over-conditioned during mid-lactation (**3.5 to 4.0** (5-point scale) or **6.0 to 7.0** (9-point scale)), reduce energy intake, check crude protein levels and consider culling inefficient producers (cows that fail to milk or that fatten excessively). If cows become under-conditioned (**2 to 2.5** range (5-point scale) or **3 to 4** range (9-point scale)), the ration is probably low in energy. Check the early lactation ration as well because the problem often begins at this time.

Late lactation (8 months to dry-off)

Recommended score is about **3.5** (5-point scale) or **6** (9-point scale). The nutritional goals are to completely replenish body fat reserves, yet prevent over-conditioning. If many cows reach the condition **4** (5-point scale) or **7** (9-point scale) range, reduce dietary energy concentration. If cows are in the low **3** (5-point scale) or **5** range (9-point scale), increase dietary energy to the mid-lactation group. Also, examine early lactation diets because conditioning problems in late lactation may begin during early as well as mid-lactation.

Dry period

It is not recommended to put over-conditioned cows on a diet at dry-off due to the risk of fatty liver. It is inefficient but acceptable to put body condition on during the dry period if it is needed to achieve a BCS of **3.5** (5-point scale) or **6.0** (9-point scale) at calving. Total body weight should increase during the dry period regardless of body condition because the calf developing inside the cow will gain 45 to 68 grams per day.

Body condition and dry cow feeding

Over-conditioning usually begins during the last three to four months of lactation when milk production decreases, but grain intake remains too high. Prolonged dry periods and overfeeding grain or corn silage during the dry period also may lead to over-conditioned cows (score 4 to 5 (5-point scale) or 7 to 9 (9-point scale)). Remember that low feed intake and milk production, reproductive disorders, and disease largely can be prevented if cows are in proper body condition at calving and are fed properly during the several weeks immediately after calving.

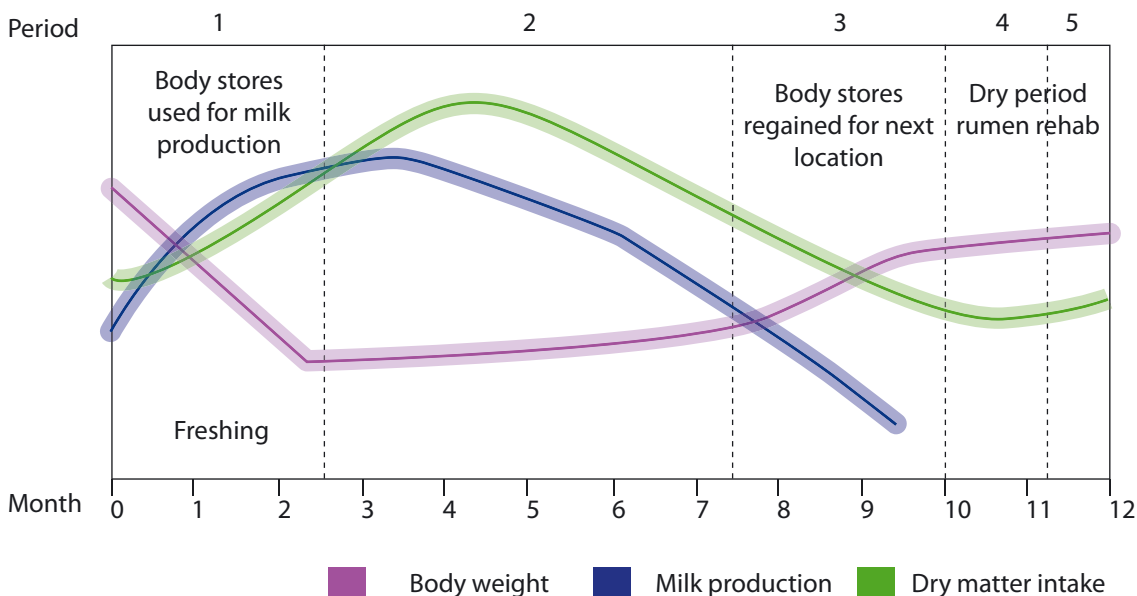
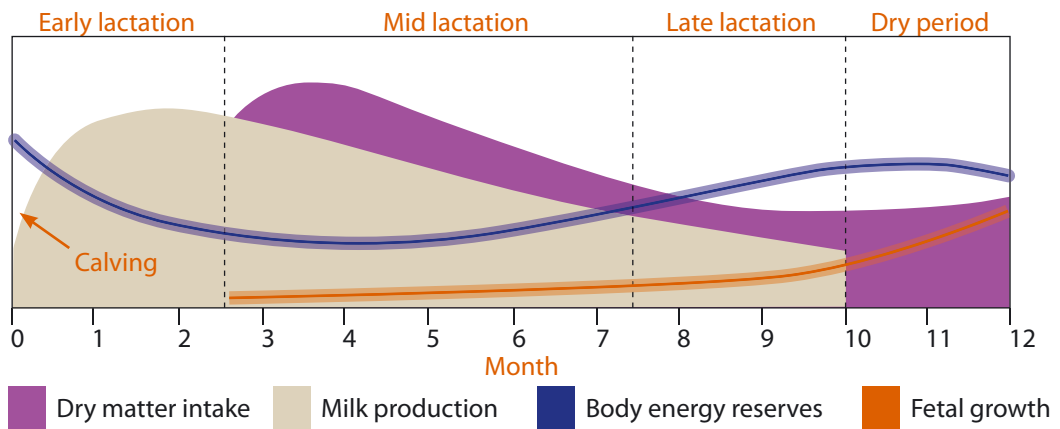


Figure 7: **Nutrient and Milk Yield Relationships in the Lactation and Gestation Cycle**

Source: <http://extension.missouri.edu/publications/DisplayPub.aspx?P=G3170>



Desired body condition score

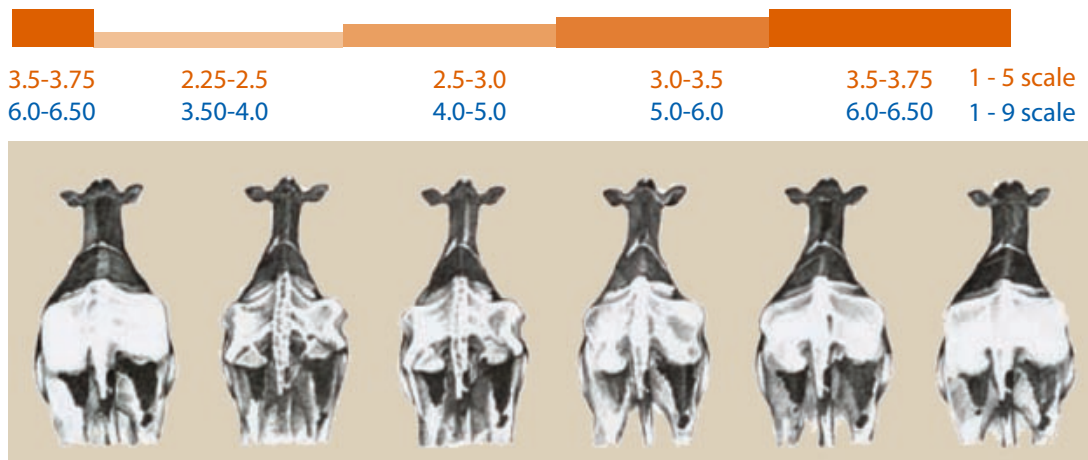


Figure 8: **Changes of Body Condition during lactation**

Source: <http://www.uky.edu/Ag/AnimalSciences/agents/training/AI8478BodyConditionScoring.pdf>

BCS at calving

- < 4.5 → reduced milk yield
- > 5.5 → reduced milk yield
- Penn State & Cornell research shows cows with a BCS > 5.5 at calving produce 2.3 kg less milk each day than cows with lower BCS during the first 30 days of lactation

BCS change after calving

- Decrease of 1 BCS unit → increase of 420 kg milk in 305-d lactation
- Body reserves essential to support milk production

BCS and Increased Health Risk

Excess Body Condition

- Fat Cow Syndrome
- Ketosis
- Displaced Abomasum
- Milk Fever
- Metritis
- Mastitis
- Lameness
- Limited Dry Matter Intake

Thin Body Condition

- Lameness

Metabolic problems can set the stage for consequences of other nutritional-stress complications, including infections such as mastitis.

BCS and Reproduction

Research indicates that cows that are too fat at calving (BCS >4 (5-point scale) or BCS >7 (9-point scale)), were more prone to reproductive diseases such as difficult calving, retained afterbirth, cystic ovaries and uterine infections than cows with lower BCS. Cows that lose more than 1 (5-point scale) or 2 (9-point scale) BCS, experience reduced fertility, which may be more pronounced if the BCS loss is rapid. Reproduction has been shown to be unaffected by BCS loss of up to 0.5 (5-point scale) or 1.0 (9-point scale) units. Cows losing more than 0.5 (5-point scale) or 1.0 (9-point scale) units of BCS have been observed to suffer some impairment in reproduction. Excessive BCS loss (>1 BCS (5-point scale) or >2 BCS (9-point scale) or too rapid a loss usually results in greater impairment. The usual observed impairment in reproduction is a longer interval to the successful establishment of pregnancy. Loeffler *et al.* (2010) presented data that indicate cows with a BCS of 5.0 achieved the highest first service conception rates. Cows above and below 5.0 attained poorer conception rates.

- Cows > 6.5 BCS at dry off were 2.8 times more likely than cows with average BCS to experience the following reproductive problems in their next lactation
 - Dystocia
 - Retained placenta
 - Uterine infection
 - Cystic ovaries
 - Abortion




Recommended BSC by Stage Lactation (on the scale 1 to 9)

Stage of lactation	DIM	BCS		
		Goal	Min	Max
Calving		6.00	5.50	6.50
Early latation	1 to 30	5.00	4.50	5.50
Peak milk	31 to 100	4.50	4.00	5.00
Mid lactation	101 to 200	5.00	4.50	5.50
Late lactation	201 to 300	5.50	5.00	6.50
Dry off	> 300	6.00	5.50	6.50
Dry		6.00	5.50	6.50

Some guidelines for managing body condition during the dry period are:

- Cows should not lose body condition during the dry period
- Cows losing condition most likely are carrying twins and should be moved to the close-up group at least two weeks early
- Cows should not lose more than one unit of body condition post-calving
- The lowest body condition score should not be less than 4.0
- Cows that are thin at dry-off may benefit from gaining condition during the dry period

Calving	
BCS < 5.50 <ul style="list-style-type: none"> • Too little energy provided in late lactation or dry period • Risk low milk production. Especially if ration is not balanced or not palatable 	BCS > 6.50 <ul style="list-style-type: none"> • Too much energy provided in late lactation or dry period • Separate dry cows from milking herd • Feed low-energy ration balanced for protein, minerals, and vitamins • Niacin may help <ul style="list-style-type: none"> • Reduce ketosis • Increase fat mobilization • Increase appetite
Early Lactation	
BCS < 4.50 and low milk production <ul style="list-style-type: none"> • Too little energy provided in ration • High producers may drop below 4.50, but condition must be regained to prevent reproductive problems 	BCS > 5.50 <ul style="list-style-type: none"> • Too little protein provided in ration to support milk production • Check intake of water, minerals, and vitamins
Peak Milk	
BCS < 4.00 and low milk production <ul style="list-style-type: none"> • Too little energy provided in ration 	BCS > 5.50 <ul style="list-style-type: none"> • Too little protein provided in ration • Check intake of water, minerals, and vitamins

 Mid Lactation	
BCS < 4.50 <ul style="list-style-type: none"> • Too little energy provided in ration • Problem probably began in early lactation 	BCS > 5.50 <ul style="list-style-type: none"> • Reduce energy intake to avoid over conditioning
 Late Lactation	
BCS < 5.00 <ul style="list-style-type: none"> • Too little energy provided in ration • Problems likely began earlier in the lactation 	BCS > 6.50 <ul style="list-style-type: none"> • Too much energy provided in ration • Also may result from extended calving intervals
 Dry Cows	
BCS < 5.50 <ul style="list-style-type: none"> • Too little energy provided in ration • Problems likely began earlier in the lactation 	BCS > 6.50 <ul style="list-style-type: none"> • Too much energy provided in ration • Also may result from extended calving intervals • Avoid BCS loss in dry period

BCS at calving affects lactation performance

- If too thin, peak milk yields will be low and reproduction will be delayed
- If too fat, metabolic diseases are very likely

Early lactation – BCS lost

- Used to support milk production
- Extreme loss hurts reproductive activity

By 80 to 120 days into the lactation

- Weight loss should be minimal
- Cows should begin to regain condition
 - Essential for strong exhibition of estrus (heat) and conception

After 120 days, all cows should be gaining about 0.75 to 1.0 pounds per day

If a cow enters the dry period fat

- Maintain body condition – DO NOT LOSE

If a cow enters the dry period thin

- May add a little condition early (first 3 weeks)

BCS and genetics

BCS is for sure a heritable trait. Heritability estimates for BCS range from 0.30 to 0.40. The genetic standard deviation on a scale of 1-9 is in the range of 0.8 to 0.9 points. So using a bull which is one standard deviation in his breeding value above population average can increase the body condition with 0.4 to 0.45 points in a herd. Up to now countries like Great Britain, the Netherlands, Ger-

many, USA, Ireland, New Zealand and Denmark score cows during the type classification of herds. The Netherlands, Ireland and New Zealand have breeding values available on bulls. In near future more countries will follow. Breeding values for BCS are valuable in breeding as it can be a help to breed more robust cows. The genetic correlation with fertility traits is considerable: -0.53 and -0.45 with respectively interval calving to first insemination and calving interval. The genetic correlation between BCS and non-return after 56 days is close to zero. Therefore the breeding value for BCS can be used as an early predictor for fertility, which helps to increase the reliability for fertility traits.

Body condition score has the strongest relationship with linear conformation traits angularity and chest width. The phenotypic correlations of BCS with angularity and chest width are -0.51 and 0.55 respectively. The genetic correlations of BCS with angularity and chest width are -0.75 and 0.71 respectively (based on Dutch data).

Body Condition Scoring Actions

Body condition scoring should be conducted during these four phases of lactation:

1. Dry-off;
2. Calving;
3. 30 days in milk; and
4. 150 to 200 days in milk.

Listed below are ideal body condition scores at each lactation stage:

- 5.0 to 6.5 at dry-off
- 5.0 to 6.5 at calving
- 3.5 to 4.5 at peak milk
- 5.0 to 6.0 at 150 to 200 days postpartum

Summary

Body condition score can give management information for the dairy farmer. First the farmer can use the score of the classifier as a reference for his body condition scores. Second, the herdbook could use the BCS to present trend in the herd in time, which can help the farmer to analyse his (feed) management. Body condition scores is of interest for the farmer as it has a strong relation with milk production and fertility. Body condition of a cow is a heritable trait with genetic variation. Selection is possible. Breeding values on BCS for bulls could help to breed a more robust cow which can produce a lot of milk, while keep enough body condition as sign for enough energy (feed) intake. Cows with enough body condition have fewer problems with fertility and health. Therefore BCS is a tool in selecting cows which balance production, fertility and health in the right way.

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Appendix












































	Score 1-5 scale	Score 1-9 scale	Spinous processes (SP) (anatomy varies)	Spinous to transverse processes	Transverse processes (TP)	Overhang- ing shelf (care rumen fill)	Tuber coxae & tuber shll	Between pins & hooks	Between the hooks	Tailhead to pins (ano- tomy varies)
Severe undercon- ditioning (emaci- ated)	1.00	1.0	Individual processes dis- tinct giving a saw - toth appearance	deep depression	very promi- nent >1/2 length visible	definite shelf, gaunt, sucked	extremely sharp, no tis- sue cover	severe depression devoid of flesh	severely depressed	bones very prominent with deep V shaped cavity under tail
	1.25	1.5								
	1.50	2.0								
	1.75	2.5			1/2 length of process visible					
Frame obvious	2.00	3.0	Individual processes evident	obvious depression		prominent shelf	Prominent	very sunken		Bones promi- nant U under cavity formed under tail
	2.25	3.5			between 1/2 to 1/3 of pro- cess visible					
	2.50	4.0	sharp prominent ridge			moderate shelf		thin flesh covering	definite depression	first evidence of fat
	2.75	4.5			between 1/3 - 1/4 visible					
Frame & covering well - bal- anced	3.00	5.0			1/4 visible	slight shelf	smooth	depression	moderate depression	Bones smooth cavity under tail shallow & fatty tissue lined
	3.25	5.5			appears smooth, TP's just discernable.					
	3.50	6.0	smooth ridge, the SPs not evident		District ridge, no individual processes discernable		covered	slight depression	slight depression	
	3.75	6.5								
Frame not as visible as covering	4.00	7.0	flat, no processes discernable	nearly flat	smooth, rounded edge	none	rounded with fat	sloping	flat	bones rounded with fat and slight fat filled depression under tail
	4.25	7.5								
	4.50	8.0			edge barely discernable			flat		
	4.75	8.5					buried in fat			
Severe overcon- ditioning	5.00	9.0	buried in fat	rounded (convex)	buried in fat	bulging		rounded	rounded	bones buried in fat cavity filled with fat forming tis- sue folds
										

Figure 1: Body condition scoring chart for Holstein/Friesian dairy cows. (Reproduced from Edmondson et al. (1989) Journal Dairy Science 72 pp 68-78.)

Table 2: Target BCS scores for Holstein dairy cattle

	On the scale 1 to 5	On the scale 1 to 9
BCS at drying off	2.75	4.50
BCS at calving	3.00	5.00
BCS at breeding	>2.50	>4.00
BCS at 150 days in milk	2.75	4.50
BCS at 200 days in milk	2.75	4.50
BCS at 250 days in milk	2.75	4.50

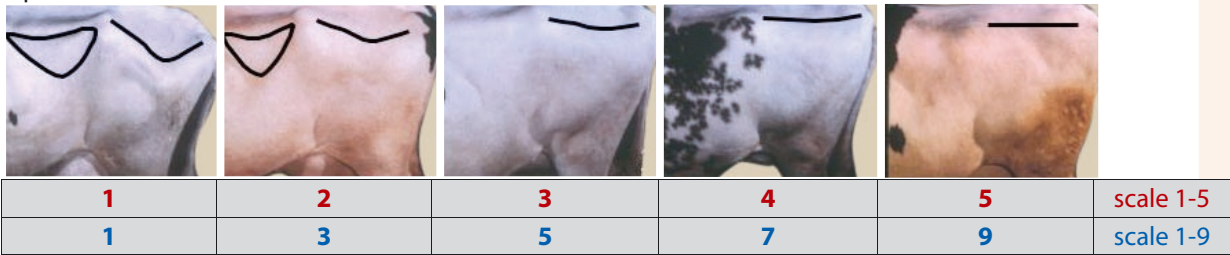
Adapted from Mulligan *et al.*, 2006

The chart below should help you determine a score for your cow. Some people like to start with the drawing an “imaginary” line between the hook and the pin bone as the first point of decision. If the line forms a “V”, the score will be less or equal to three. If the line forms a “U”, the score will be three or above. I prefer to use a combination of at least two factors to help me make my mind up.

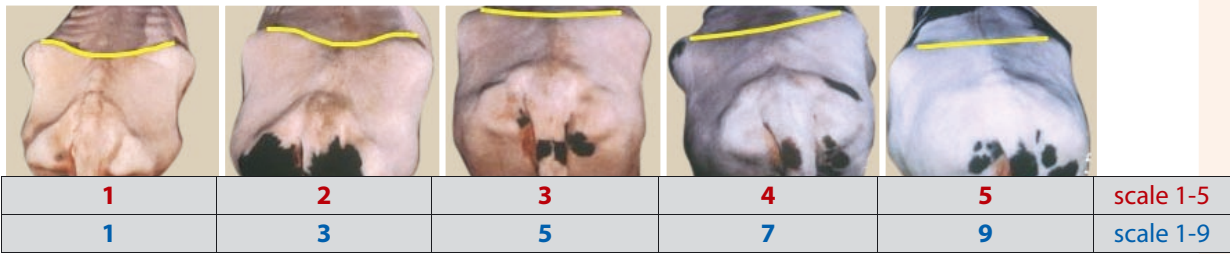
Score		Body parts	Vertebrae in the loin area	Cross section at the hook bones	Line from the hook bone to the pin bone	Cavity between tailhead and pin bone	
			Rear	Rear	Side	Rear	Angled
1	1	Severe underconditioning or extremely thin					
3	2	Frame obvious					
5	3	Frame and covering well balanced					
7	4	Frame not as visible as covering					
9	5	Severe over-conditioning or extremely fat					

Source: Michel, 2008

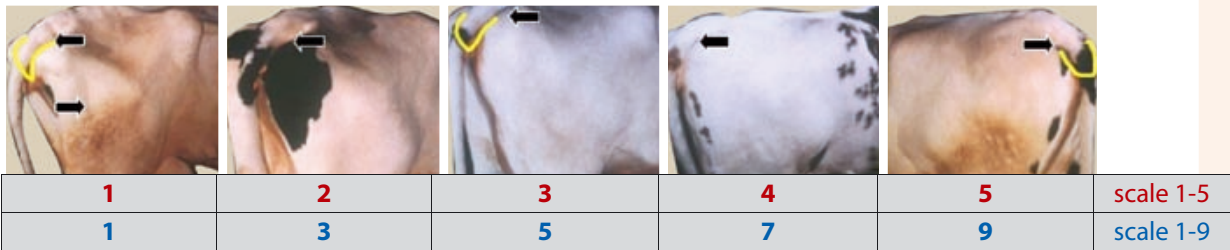
In the image below, you can easily distinguish the line between the hook and the pin in combination with the depression (overhang shelf) helps me determine whether a cow should be scored less or equal to three or not.



Then, I try to move my eyes to image the cross section through the hook bones and the vertebrae in front of the hook bones. The lateral (side) protuberance of the vertebrae and the vertical protuberance of the vertebra between the hooks help me make additional decision. If the vertebrae are hardly apparent because they are “buried” deeply in adipose tissue, then we talk of a score of four or five. However, at the other extreme, the degree with which the vertebrae “stick out” and the degree to which they are surrounded by deep depressions on each side of them, is the criteria that I use to separate a score of two from a score of one



Finally, we try to focus our attention on the tail-head area and the tight. Here we are looking for actual amount of “fat covering. A score of one shows very deep depression around the tail. The tails “falls” into a “sharp “V” formed by the bony area between the pins. There is just no fat to keep the tail “up”. Also the absence of subcutaneous fat (fat right underneath the skin, makes the demarcation between muscle visible in low body condition scores.



Practice



scale 1-5	scale 1-9
1	1



2	3
---	---



3	5
---	---



4	7
---	---



5	9
---	---

Hint:

- Start with deciding if her score will be:
 - 3 (5-point scale) or 5 (9-point scale) above, or
 - 3 (5-point scale) or 5 (9-point scale) or below.
- From there, built your decision tree.
- Be methodical and consistent.

Period of lactation	Score scale 1-5	Score scale 1-9
Calving	3.25 -3.75	5.5-6.5
Remark: Adjust energy density of the ration maintaining minimum fiber to minimize BCS loss.		
Breeding	2.5- 2.75	4.0 - 4.5
Remark: Cows that are “too thin” run low in “fuel” resulting in poor production and fertility. Cows should not be losing more than 1 unit of BCS between calving and breeding.		
Late lactation	3.0 - 3.5	5.0-6.0
Remark: Watch out, it is hard to prevent obesity in cows with more than 450 d calving intervals.		
Dry period	3.25 -3.75	5.5-6.5
Remark: DO NOT use the dry period to alter BCS. There is just not enough time!		

Body condition scoring system for beef cattle

	Score	Description
thin	1	Severely emaciated; <ul style="list-style-type: none"> starving and weak; no palpable fat detectable over back, hips or ribs; tailhead and individual ribs prominently visible; all skeletal structures are visible and sharp to the touch; animals are usually disease stricken. Under normal production systems cattle in this condition score are rare.
	2	Emaciated; <ul style="list-style-type: none"> similar to BCS 1, but not weakened; little visible muscle tissue; tailhead and ribs less prominent.
	3	Very thin; <ul style="list-style-type: none"> no fat over ribs or in brisket; backbone easily visible, slight increase in muscling over BCS
borderline	4	Very thin; <ul style="list-style-type: none"> no fat over ribs or in brisket; backbone easily visible, slight increase in muscling over BCS
optimum	5	Moderate; <ul style="list-style-type: none"> increased fat cover over ribs, generally only 12th and 13th ribs are individually distinguishable; tailhead full, but not rounded.
	6	Good; back, ribs, and tailhead slightly rounded and spongy when palpated; slight fat deposition in brisket.
fat	7	Fat; <ul style="list-style-type: none"> cow appears fleshy and carries fat over the back, tailhead, and brisket; ribs are not visible; area of vulva and external rectum contain moderate fat deposits; may have slight fat in udder.
	8	Very fat; <ul style="list-style-type: none"> squared appearance due to excess fat over back, tailhead, and hindquarters; extreme fat deposition in brisket and throughout ribs; excessive fat around vulva and rectum, and within udder; mobility may begin to be restricted.
	9	Obese; <ul style="list-style-type: none"> similar to BCS 8, but to a greater degree; majority of fat deposited in udder limits effective lactation. Under normal production systems cattle in this condition score are rare.

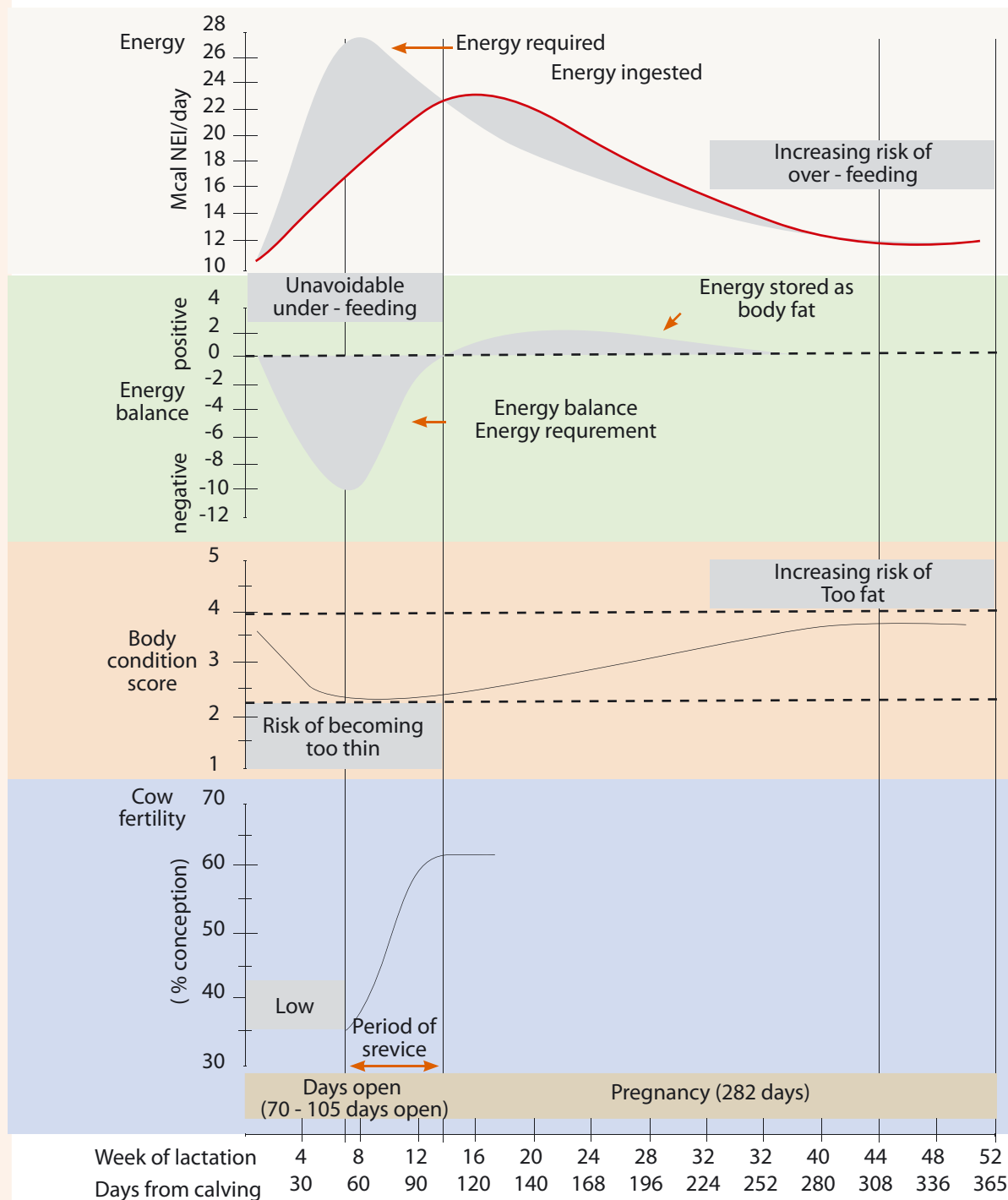


Figure 2: **Energy balance of dairy cows in early lactation**

