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Body condition scoring and weight estimation of horses

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Summary

Three hundred and seventy two horses of varying breeds, height and fatness were weighed and measured for height at the withers. They were assessed for condition score by adaptation of a previously published method. The heart girth and length of 281 of the horses were also measured. Weight of horses was highly correlated ($P<0.001$) with height ($r^2=0.62$), condition score ($r^2=0.22$) and girth^2 x length ($r^2=0.90$). Nomograms were constructed to predict weight from height and condition score, and girth and length measurements. Weight can also be accurately estimated from the formula:-

$$\text{Weight (kg)} = \frac{\text{girth}^2 \times \text{length (cm)}}{[Y]}$$

The average value of 'Y' in this experiment was 11900 and this estimated weight with more accuracy than some previously published values of 'Y'. Racing Thoroughbred horses were found to be significantly lighter than non-racing Thoroughbreds of the same height and condition score. The method of assessment of condition score was shown to be repeatable between different operators with varying degrees of experience.

Introduction

MANY horse owners fail to recognise significant variation in the weight of horses, due to changes in body condition or variation due to age and breed types. This often results in underfeeding or overfeeding. Weighing scales suitable for horses are rarely available and therefore estimation of bodyweights by owners and veterinarians is required for administration of anthelmintics, anaesthetics and other drugs. Traditional methods of weight estimation rely on calculation from a formula using girth and length measurements (Milner and Hewitt 1969; Hall 1971; Ensminger 1977; Leighton-Hardman 1980).

Body condition scoring is an alternative method utilised extensively as a management aid in sheep (Russel 1984), dairy cattle (Earle 1976) and beef cattle (Graham 1982). Body condition scoring of horses involving palpable and visual assessment of the degree of fatness of the neck, back, ribs and pelvis has been described by Leighton-Hardman (1980) and Henneke, Potter, Kreider and Yeates (1983). The purposes of this work were: 1) to obtain reliable estimates of bodyweight from linear measurements and condition score of a large number of horses of variable fatness; 2) to establish standards for the procedure of condition score measurement.

Materials and methods

Three hundred and seventy two horses and ponies were weighed using a Sensi-Weigh Cattle Scale (J. W. Wedderburn & Sons, Thornbury, Victoria, Australia), had their height measured at the withers and were assessed for condition score. The accuracy of the scale was checked on each occasion by calibration with a known 80 kg weight. The horse's height was measured at the highest point of the withers with the horse standing squarely on a level surface and the head in a normal position. The condition scoring system was adapted from that published by Leighton-Hardman (1980) (Table 1). In addition, heart girth and length from the point of the shoulder to the tuber ischii (point of buttocks) were measured in 281 of the horses. Girth was measured immediately posterior to the elbow following respiratory expiration. The weight was recorded to the nearest kilogram, height measured in hands and then converted to centimetres and the length and girth measurements were recorded to the nearest centimetre.

This study examined Thoroughbred racehorses, non-pregnant Thoroughbred broodmares, Standardbreds, horses used by Mounted Police and pony clubs, ponies and other breeds. They ranged in height from less than 12 hands (122 cm) to more than 17 hands (173 cm) (Fig 1). Their condition scores (CS) ranged from 1 to 5 with 3.5 being the most prevalent score. The following groups each contained over 50 horses: **CS 2.5, CS 3, CS 3.5, CS 4**; whereas **CS 1, CS 1.5** and **CS 2** contained between 10 and 50 horses each. **CS 4.5** and **CS 5** contained less than 10 horses. The weights recorded ranged from 160 to 680 kg. Each 20 kg range between 280 kg and 640 kg contained at least 10 horses. The median weight range was 460 to 479 kg.

The horses were placed into five height categories (12 hand [122-131 cm], 13 hand [132-141 cm], 14 hand [142-151 cm], 15 hand [152-162 cm], 16 hand [163-172 cm]) and then grouped according to condition score. Average weight, standard error and confidence limits were calculated for each group. No horses were measured in the 13 hand (132-141 cm) **CS 1** group or the (14 hand (142-151 cm) **CS 5** group. The small number of results did not allow confidence limit calculation in the following groups: 12 hand (122-131 cm) **CS 1**, 12 hand (122-131 cm) **CS 5**, 13 hand (132-141 cm) **CS 5**, 14 hand (142-151 cm) **CS 1**, 16 hand (163-172 cm) **CS 5**.

Previous formulae (Milner and Hewitt 1969; Hall 1971; Ensminger 1977; Leighton-Hardman 1980) were compared with our calculations for the divisor 'Y' in the horse weight prediction equation:-

$$\text{Weight (kg)} = \frac{\text{girth}^2 \times \text{length (cm)}}{[Y]}$$

Correlations were calculated between weight and height, girth, length, condition score and girth^2 x length. The correlation between condition score and 'Y' was also calculated. Regression analyses of weight against height and condition score, and weight against girth^2 x length were used to construct nomograms for prediction of weight. The nomograms were constructed according to the procedure described by Smith (1968).

In a separate experiment, 20 non-pregnant Thoroughbred mares were weighed, condition scored and had their height

TABLE 1: Body Condition Score System

	Neck	Back and Ribs	Pelvis
0 Very Poor	Marked 'ewe' neck Narrow and slack at base	Skin tight over ribs Spinous processes sharp and easily seen	Angular pelvis – skin tight Deep cavity under tail and either side of croup
1 Poor	'Ewe' neck Narrow and slack at base	Ribs easily visible Skin sunken either side of backbone. Spinous processes well defined	Rump sunken, but skin supple Pelvis and croup well defined Deep depression under tail
2 Moderate	Narrow but firm	Ribs just visible. Backbone well covered Spinous processes felt	Rump flat either side of backbone Croup well defined, some fat Slight cavity under tail
3 Good	No crest (except Stallions) Firm neck	Ribs just covered – easily felt No 'gutter' along back Spinous processes covered, but can be felt	Covered by fat and rounded No 'gutter' Pelvis easily felt
4 Fat	Slight crest Wide and firm	Ribs well covered - need firm pressure to feel 'Gutter' along backbone	'Gutter' to root of tail Pelvis covered by soft fat – felt only with firm pressure
5 Very Fat	Marked crest Very wide and firm Folds of fat	Ribs buried – cannot feel Deep 'gutter' Back broad and flat	Deep 'gutter' to root of tail Skin distended Pelvis buried – cannot feel

Adjust the pelvis score by 0.5 point if it differs by 1 or more points from the back or neck scores to obtain the condition score. (Adapted from Leighton-Hardman 1980.)

recorded by the studfarm manager. Independent condition scoring by one author and other horsemen was carried out twice using 15 horses on both occasions. The other horsemen had no prior familiarity with the condition scoring system.

Results

The means of weight and error bars of twice the standard error are shown in Fig 1 for each condition score group in a height range. Height and condition score were positively correlated with weight.

Nomograms for prediction of weight from height and condition score and from girth and length are shown in Figs 2 and 3. In both cases the relationship was significant ($P<0.001$), with the regression equation used to construct the girth and length nomogram having a slightly higher correlation ($r^2=0.837$ *vs* 0.825) and a lower standard error (se=37.2 *vs* 42.7).

Highly significant correlations ($P<0.001$) were found between weight and all factors measured (Table 2). Girth^2 x length was the most highly correlated factor measurement. When grouped in height ranges the correlation between condition score and weight increased. Condition score was not closely related with 'Y' ($r^2=0.08$).

The average value of 'Y' was 11877.4 cm^3/kg. This is listed in Table 3 for comparison with previously published values. When grouped according to condition score, the only significant difference in 'Y' between adjacent condition scores was between CS 2.5 and CS 3. Horses having condition scores less

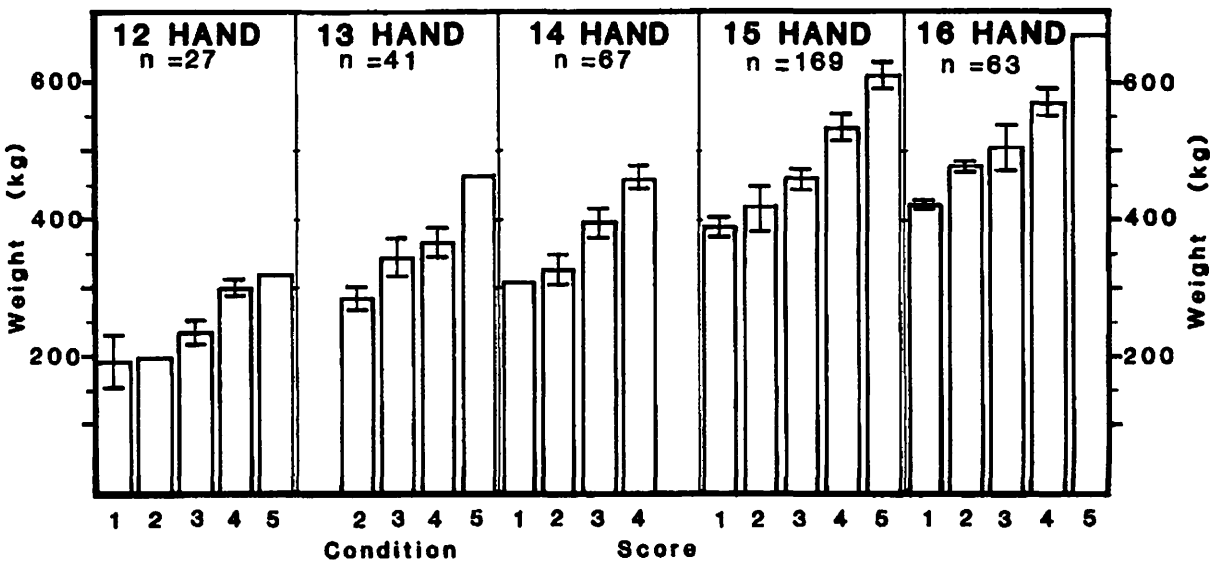

Fig 1. Average weight of horses of each condition score in height ranges (error bars show twice the standard error)

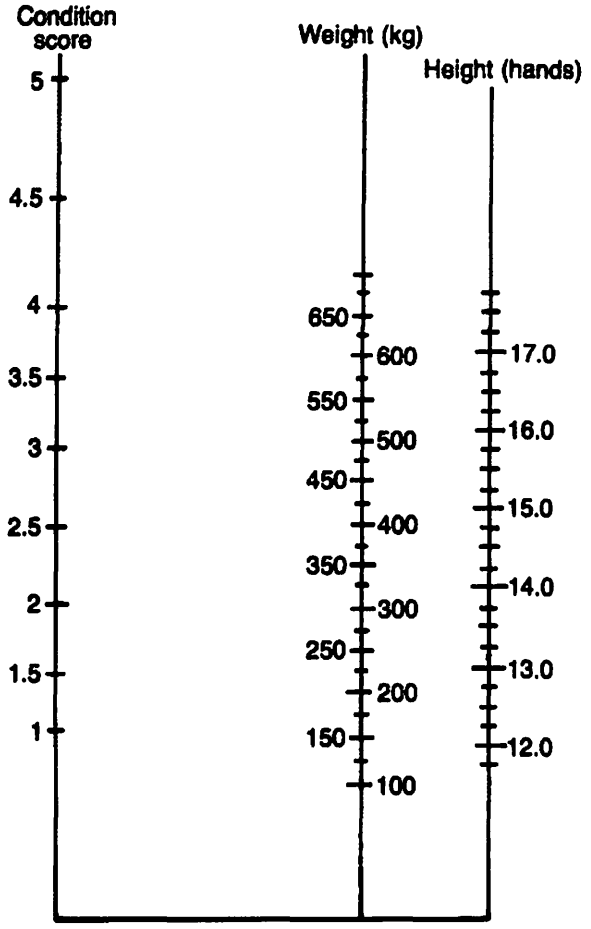

Fig 2. Nomogram for estimation of bodyweight from condition score and height measurement

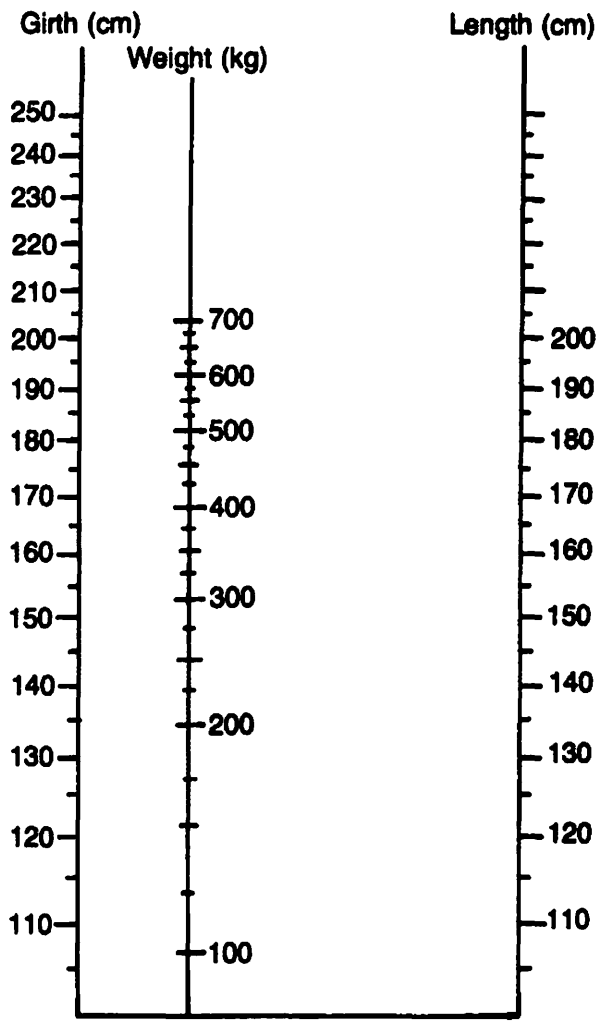

Fig 3. Nomogram for estimation of bodyweight from girth and length measurements

than 3 had a higher average value for 'Y' than those of condition score 3 or above (12265 *vs* 11706).

A comparison of the average weights of racing and non-racing Thoroughbreds is shown in Table 4. In all groupings, significant differences ($P<0.05$) were noted in average weight between racehorses and non-racehorses of the same height and condition score.

The Thoroughbred racehorses were grouped according to sex and no significant difference ($P>0.05$) was seen amongst the average weights of geldings (460.0 kg), colts (451.1 kg), and fillies and mares (449.8 kg).

The independently assessed group of Thoroughbred mares varied little in height and their condition score was highly correlated with weight ($r^2=0.704$, $P<0.001$). The average weight of mares of each condition score within the 15.0 to 15.3 hand (152 to 162 cm) and 16.0 to 16.3 hand (163 to 172 cm) ranges was calculated in the independently assessed group and this was compared with the average weight of horses of the same height and condition score in the authors' sample. No significant difference in weight was present between comparable groups in the independent sample and the authors' sample indicating accurate use of the condition scoring system.

Good correlation was present between the condition score results of one author and other horsemen when scoring 30 horses. The condition scores were the same in 65 per cent of horses and the maximum difference was 0.5 point.

Discussion

The body condition scoring system used in this study provided an objective assessment of body condition. The 0 to 5 system described was adapted from that used by Leighton-Hardman (1980) and was preferred to the 1 to 8 system used by Henneke *et al* (1983). A 0 to 5 system is also used in sheep (Russel 1984) and beef cattle (Graham 1982) condition scoring and the 0 to 5 horse system was considered simpler to use. The method used for assessing body condition takes into account the deposition of body fat in different areas by separate examination of the neck, back, ribs, pelvis and rump. Individual horses deposit their body fat in different areas of the body, and this method takes account of the whole body; and individual neck, ribs and rump assessments are then combined to give an overall condition score. By itself, condition score was not closely related to weight, but when height was constant, bodyweight was highly correlated with condition score. Henneke *et al* (1983) found that condition score was more closely related to body fat content than any other single physical measurement. The method was shown to be repeatable when used by horsemen with no previous experience of the system, and this

TABLE 2: Correlations (r^2) between weight and physical measurements

Girth	0.87***
Length	0.75***
Height	0.62***
Condition score	0.22***
Girth^2 x length	0.90***
Girth x height	0.84***
Girth x length x height	0.85***
Height x condition score	0.45***

***P<0.001

repeatability has also been shown in other species (Graham, Clark and Spiker 1982).

Deviations from the desired body condition and changes in workload, pregnancy and lactation are the main factors which influence the feed requirements of a horse. Condition scoring can be used to monitor the response to changes in the horse's feed intake.

If a horse's condition score and approximate height are known, the weight of the horse can be estimated as shown in Fig 1. Use of the height condition score nomogram (Fig 2) will increase accuracy as the exact height and condition score can be used to calculate the weight. The girth length nomogram (Fig 3) will provide the most accurate method of weight estimation as girth and length are the factors most closely correlated with weight.

Effective use of the weight prediction nomograms depends on accurate body measurements and condition score estimation. Girth measurement errors and condition score errors lead to greater inaccuracy than do length or height measurement errors. However, if height is estimated rather than measured, considerable inaccuracies can occur. Measurement or assessment inaccuracies lead to weight estimation errors of greater magnitude in both fatter and heavier horses than in thinner and lighter horses. Factors influencing height measurement include having the horse relaxed, standing squarely on a level surface with the head in the normal position and making allowance for shoes (Hickman and Colles 1984). For maximum accuracy in measuring length, two people are required to hold the tape. A 2 m tape is sufficient for all but the largest horses when girth can exceed 2 metres. Use of the nomogram for weight prediction cannot take account of changes due to hydration or variation in the weight of intestinal contents. Up to 5 per cent dehydration may be clinically undetectable (Carlson 1983) and the gastrointestinal tract proportion of body weight may vary from 5 to 20 per cent depending upon the time since feeding and the feed type (Webb and Weaver 1979).

The divisor 'Y' in the traditional formula for weight estimation is similar to the value reported by Hall (1971). Use of this formula provides an accurate method of weight estimation, but it is more cumbersome to use than the nomogram. It cannot be compared to the value of Milner and Hewitt (1969), where

TABLE 3: Weight estimation by measurement of girth and length and comparison of authors' results with published 'Y' values

Source	Metric	Imperial
	(cm^3/kg)	($inches^3$/lb)
Authors' results	11877.4	329.5
Hall	11880.0	330.0
Ensminger[a]	10815.0	300.0
Leighton-Hardman[b]	10486.0-10912.0	291.0-303.0

[a]Add constant of 22.7kg (50lb);
[b]Value chosen depends on breed or sex of horse

TABLE 4: Comparison of average weights of racing and non-racing Thoroughbred horses

Height (hands)	15.0-15.3H		15.0-15.3H		16.0-16.3H		16.0-16.3H	
	Race		Non-race		Race		Non-race	
Condition Score	n	Wt	n	Wt	n	Wt	n	Wt
2.5	5	416.1*	9	458.9	4	438.8*	8	491.7
3	18	435.1***	10	484.1	6	480.7*	11	540.6
3.5	12	464.4***	28	517.9	6	484.8*	10	532.2
4	7	458.4***	22	556.1	2	512.0*	6	579.2

***P<0.001; **P<0.01; *P<0.05

length was measured to the point of the hip, or the Immobilon Dosage Calculator (Reckitt and Colman, England) where length is measured from the olecranon process. According to our results, application of the Leighton-Hardman (1980) formula would lead to a weight over estimation of 10 per cent whereas the Ensminger (1977) formula would over estimate weight to a greater extent because it incorporates an added constant of 22.7 kg. This could have serious consequences when calculating dosages of drugs which have a low safety margin.

It has been suggested that the value for 'Y' should be increased for low condition score horses and decreased for high condition scores horses in an almost linear manner (Leighton-Hardman 1980). The authors found that the only significant difference in 'Y' between adjacent condition score groups was between score 2.5 and 3.0. In no case did the values of Leighton-Hardman (1980) fall within the confidence limits (P>0.05).

Retired Thoroughbred racehorses were found to be significantly heavier than their racing counterparts of the same height and condition score. A decrease in weight during training due to a reduction in fat cover has been reported by Snow, Munro and Nimmo (1982). Age would account for some of the appreciable difference as 90 per cent of the racehorses were two- or three-year-olds and the non-racehorses were mainly mature horses. Increases in the weight of intestinal contents caused by the roughage based diet fed to the non-racing group may also be important. The height and condition score nomogram will over estimate the weight of racing animals and it should not be used, whereas the girth and length scale is suitable for weight estimation.

No significant sex differences in weights were found in racing horses which is not surprising given the finding that Thoroughbred colts and fillies had no significant difference in their height and girth up to three years of age (Green 1976).

Condition scoring can be used as a repeatable and objective method of assessing a horse's body condition. This is essential for instituting appropriate feeding management and monitoring the effect of different feeding regimes. It can be used with height estimation or measurement to provide a useful weight estimate that is almost as accurate as that derived from the girth and length formula or nomogram.

Acknowledgements

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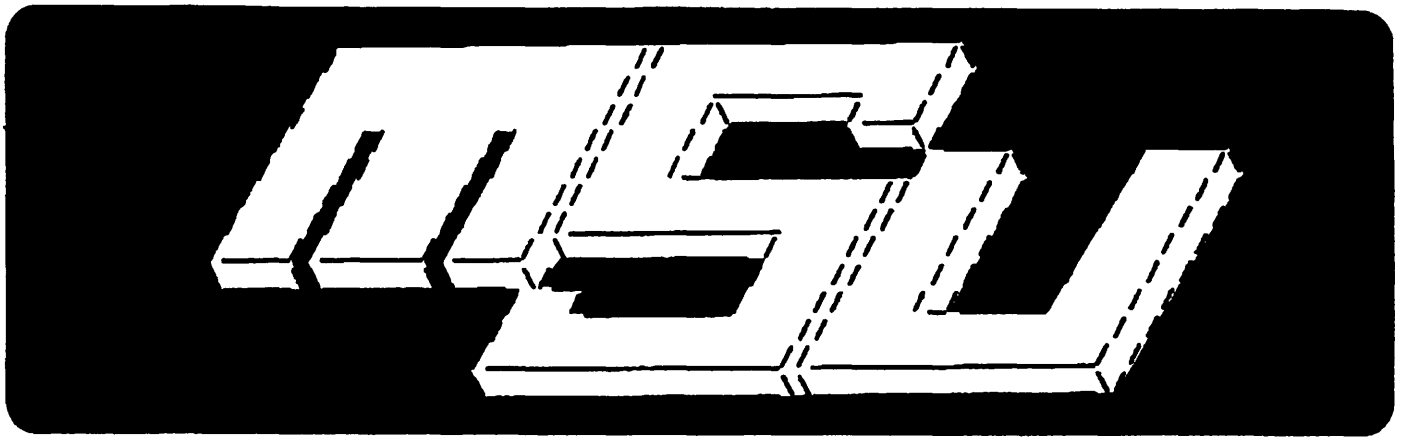

BODY CONDITION SCORING— A Management Tool

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Adequate body reserves are necessary to maintain the health, reproductive and productive capacity of all dairy cattle. In the dairy cow fat covering is an indicator of the amount of stored energy. Cows without adequate body reserves are prone to disease, metabolic disorders, impaired reproductive efficiency, and reduced milk production. In heifers, lack of body reserves will delay breeding and will lower milk production after calving.

On the other hand, excessively fat cows are predisposed to calving difficulties, fatty liver after calving and often death. This condition has been termed Fat Cow Sydrome. Even cows that recover from this condition experience lower milk and butterfat production as well as increased risk of other disease conditions. Heifers that are fat at puberty fail to develop their full mammary gland capacity resulting in lower lifetime production. Problems of repeat breeding are also reported for overly fat heifers at puberty.

The body fat covering of dairy cattle changes with different stages of lactation. Fresh cows lose body fat because they are unable to eat enough to meet the energy requirements for their high milk production. Late lactation and dry cows can add large amounts of body fat because they are able to eat more energy than they require for the amount of milk they produce.

Dairy farmers need to be aware of what body condition their cows and heifers are in so that they can adjust management practices and feed rations as needed.

The body reserves of dairy cows are evaluated by a procedure known as body condition scoring. When body condition scoring, the fat covering around the rump and loin is evaluated and the cow is given a numeric score based on this evaluation. Body condition is scored between 0 and 5 with half scores in between. This gives a total of 11 possible body scores. A condition score of 0 is found only in animals near death and so will be ignored in this bulletin. Use of the body condition score system enables a farmer to accurately evaluate the body reserves of a cow and describe it to other people in a consistent way that everyone can understand.

Body scoring of dairy cattle can be learned with a little training and careful observation. Although the evaluator uses both sight and touch to evaluate the body fat covering, accurate body condition cannot be judged without feeling the cow.

*F. M. Hall is the manager of the Michigan Holstein Association.

HOW TO BODY CONDITION SCORE DAIRY COWS

Body condition score is largely determined by the amount of fat covering around the rump and tailhead area. The loin area is also evaluated. The final body condition score can be adjusted 1/2 score if the loin differs from the rump by more than 1 point.

Although most body condition scoring is done from directly behind the animal, it is a good idea to observe the cow from the side to get some idea of the depression in the loin area.

To begin scoring, stand directly behind the cow. Make sure the cow is relaxed before beginning the scoring procedure because muscle tightness will result in inaccurate scoring. Observe the degree of depression around the tail head. Then score the rump area by placing the hands on the pin bone and pelvic bone and feeling for the amount of fat covering. See Figures 1 and 2 for where to place your hands for the rump score. Always use the same hand to score cows. Score the rump to the nearest 1/2 score.

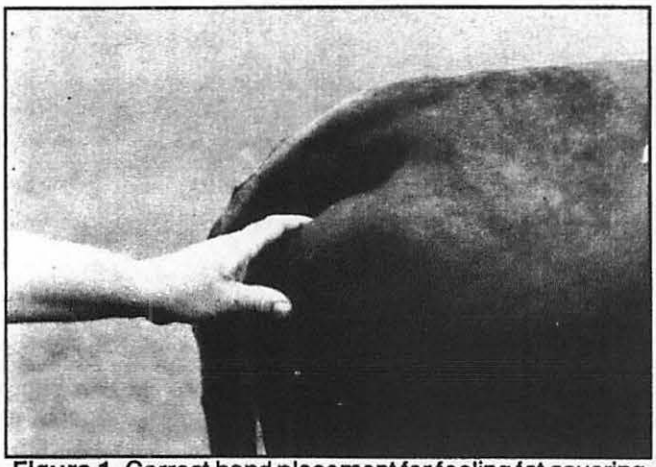


Figure 1. Correct hand placement for feeling fat covering over pin bones.

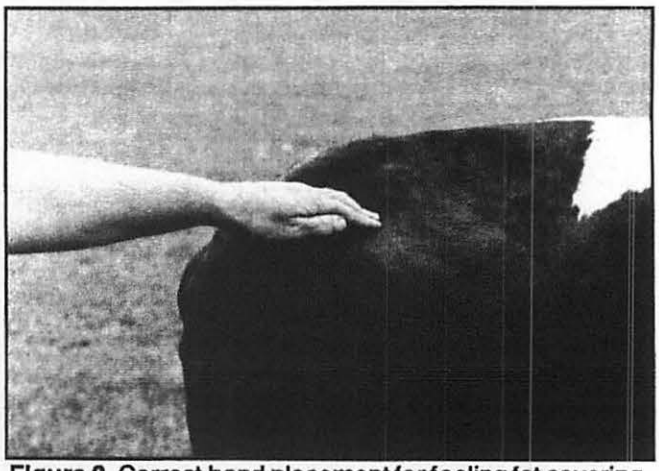


Figure 2. Correct hand placement for feeling fat covering over pelvic bone.

Then score the loin area in the same way, using the same hand. See Figure 3. Assess this score to the nearest 1/2 unit.

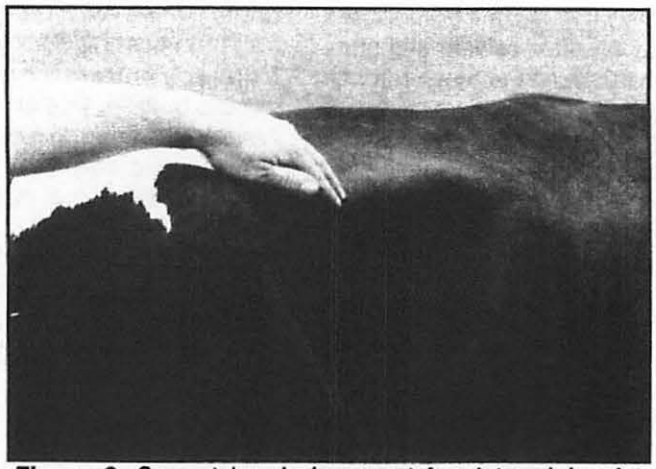


Figure 3. Correct hand placement for determining fat covering over short ribs and loin.

BODY CONDITION SCORE 1

Rump Area Deep cavity around tailhead. No fatty tissue felt between pins. Pelvic bone easily felt. Skin is supple.

Loin Area Ends of short ribs sharp to touch. Upper surfaces can easily be felt. Deep depression in loin.

BODY CONDITION SCORE 2

Rump Area Shallow cavity lined with fatty tissue at tailhead. Some fatty tissue felt under pin bone. Pelvis easily felt.

Loin Area Ends of short ribs feel rounded. Upper surface felt with slight pressure. Depression visible in loin.

BODY CONDITION SCORE 3

Rump Area No visible cavity around tailhead. Fatty tissue is easily felt over whole rump. Skin appears smooth. Pelvis is felt with slight pressure.

Loin Area Ends of short ribs can be felt with pressure. There is a thick layer of tissue on top. There is only a slight depression in the loin.

BODY CONDITION SCORE 4

Rump Area Folds of fatty tissue are visible around tailhead. Patches of fat are present around the pin bones. Pelvis is felt only with firm pressure.

Loin Area Short ribs can't be felt even with firm pressure. No depression is visible in loin between backbone and hip bone.

BODY CONDITION SCORE 5

Rump Area Tailhead is buried in fatty tissue. Skin is distended. No part of pelvis can be felt even with firm pressure.

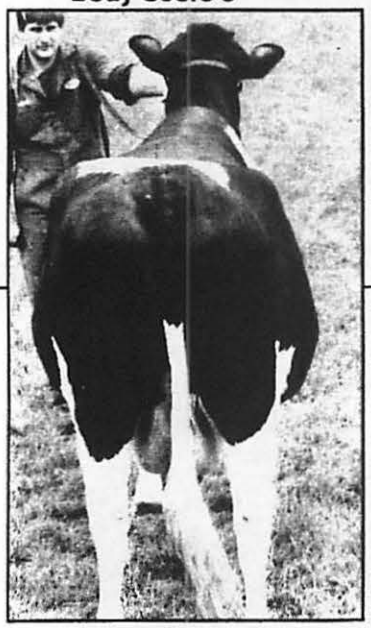
Loin Area Folds of fatty tissue over short ribs. Bone structures can't be felt.

Body Score 1

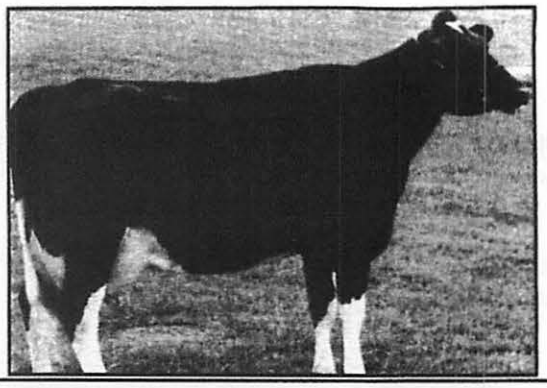
Body Score 2

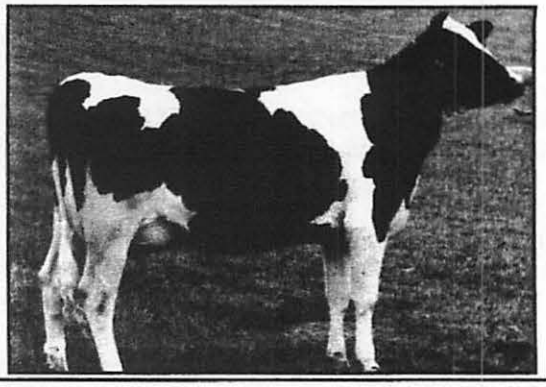
Body Score 3

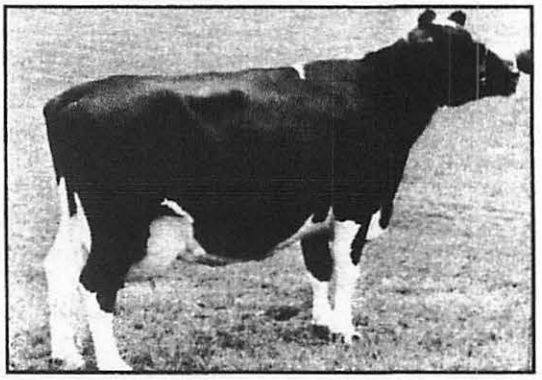
Body Score 4

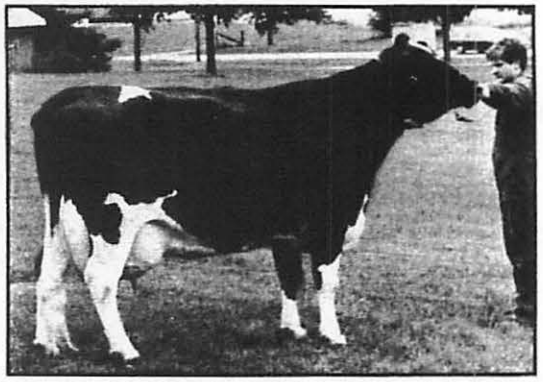


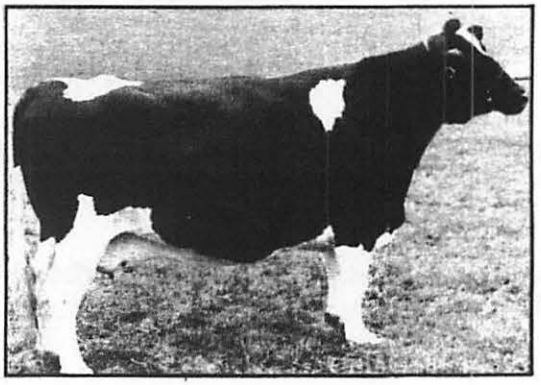
Body Score 5











If the loin area score is different than the rump score by more than 1 unit, adjust the rump score up or down 1/2 unit. This will be the final body condition score. An example of this adjustment is presented below:

Rump Score	Loin Score	Difference	Adjustment	Final Score
4.0	2.5	1.5	-0.5	3.5
3.0	2.5	0.5	0	3.0

On pages 4 and 5 are pictured dairy cows representative of the 5 major body condition scores along with the description of how each condition should look and feel. Use these photographs as guides when body scoring cows. After several hours of practice, you will become quite proficient at body condition scoring.

WHEN COWS SHOULD BE BODY SCORED

Ideally cows would be scored monthly or bimonthly. In most herds, especially those in free stall housing, this becomes a major undertaking. However, there are times when cows should be body condition scored and the scores written down if good use is to be made of the information. These times include:

For cows-
1. At calving
2. At 5-6 weeks after calving (at approximately peak milk production)
3. At 150-200 days after calving (in mid lactation)
4. At dry off

For heifers-
1. At six months of age
2. At breeding
3. At calving

At these times cows should score in the ranges listed in Table 1 below.

If the body condition scores of the cows are outside the reasonable range, management steps should be taken to correct the problem. The most important thing to look at is the change in body condition between one stage of lactation and another. Careful ration balancing and recommended management of cows at various stages of life will ensure proper body condition. A list of possible causes of undesirable body scores and their possible causes as well as suggested remedies is presented in Table 2 on page 6.

Use of body condition scoring is one more technique that will allow fine tuning the nutrition program of the herd and improve management ability. Preventing production losses as well as preventing disease and reproductive losses by ensuring proper body condition will be more than worth the small amount of time it takes to learn the body scoring technique.

Table 1. Desired and reasonable body condition scores of dairy cattle at critical times.

Time of Scoring	Desired Score	Reasonable Range
<u>Cows</u>		
Calving	3.5	3.0 - 4.0
Peak Milk	2.0	1.5 - 2.0
Mid-Lactation	2.5	2.0 - 2.5
Dry Off	3.5	3.0 - 3.5
<u>Heifers</u>		
6 Months	2.5	2.0 - 3.0
Breeding	2.5	2.0 - 3.0
Calving	3.5	3.0 - 4.0

Table 2. Cause of Undesirable Body Condition Scores and Their Possible Remedies.

Time	Score	Possible Cause	Remedy
Cows			
Calving	High	Dry cows gaining excessive weight	Reduce energy in dry cow ration
		Cows dry off in excessive condition	Reduce ration energy in last 1/3 of lactation
		Cows dry too long	Limit dry period to 60 days
	Low	Dry cows losing weight on dry cow ration	Increase energy and/or protein
		Cows dry off in poor condition	Increase energy in last 1/3 of lactation
Peak	High	Cows fail to achieve peak milk production	Increase crude protein in ration to 17%
	Low	Cows too thin at calving	Adjust body condition in last 1/3 of lactation
		Cows lose weight excessively	Increase/decrease grain to .76 MCal per lb. of ration dry matter; raise fiber to 20% ADF, 30% NDF
Mid	High	Cows fail to milk	Cull cows that fail to milk or that fatten excessively
		Cows on high energy diet for too long	Balance ration to meet energy needs in late lactation
	Low	Cows not recovering from loss of condition in early lactation	Maintain energy density of .76 MCal/lb.; avoid switching to rations with much lower energy densities
Dry off	High	Cows receive excess energy in late lactation	Balance energy to cows' productive needs
		Cows not rebred on time	Consider culling
	Low	Cows not gaining adequate condition in last 1/3 of lactation	Increase energy in ration last 1/3 of lactation
Heifers			
6 months	High	Too much energy in diet	Reduce amt. of grain fed to 5 lbs./day
	Low	Too little energy in diet	Increase amt. of grain in diet; consider a commercial calf starter
		Disease	Consult veterinarian
Breeding	High	Too much energy	Reduce amt. of grain fed; limit amount of corn silage
		Lack of adequate protein	Raise protein in diet to 13-15%
	Low	Lack of energy in the diet	Increase energy as grain and/or switch to higher quality forage
Calving	High	Too much energy in diet	Little danger to 1st calf heifer unless body score approaches 5
	Low	Lack energy in diet	Increase energy as grain and/or feed quality forage. Heifers should gain 1 condition score from breeding to calving.

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Assessing Sow Body Condition

Richard D. Coffey, Extension Swine Specialist; Gary R. Parker, Extension Swine Specialist; and Kevin M. Laurent, Extension Associate

Introduction

A critical element of successful swine reproduction is managing sows so they do not gain or lose too much weight or body condition between parities. Maintaining sows in proper body condition throughout their lives can lead to more consistent reproductive performance, but inadequate control of sow body weight and condition can lead to farrowing difficulties, poor rebreeding performance, and high culling rates. In addition, the direct economic impact on annual feed costs of underfeeding or overfeeding sows can be substantial. For example, feeding a herd of 200 sows during gestation an extra daily allotment of 0.5 pounds of a feed that costs $135 per ton will increase annual feed cost by about $2,400.

General recommendations for feeding sows can be obtained from several sources, including universities, private nutritional consultants, feed industry representatives, and veterinarians. However, because individual operations vary in terms of animal genetics, environmental conditions, and management, these general recommendations may not be adequate. Therefore, it is important to monitor sows on individual farms to determine the adequacy of current feeding management practices.

The purpose of this publication is describe a sow body condition scoring system that requires only a minimal amount of time and does not require any specialized equipment. This scoring system can then be used to determine individual gestation feeding levels to achieve a target condition score at farrowing.

Sow Body Condition Scoring System

This scoring system uses finger or hand pressure at key points on the sow's body to arrive at a number, or "score"—hence the name "sow body condition score." The points used on the sow's body are those areas where the only tissue between the skin and bones is fat tissue. These areas on the sow include the ribs, back bone, "H" bones, and "pin" bones (Figure 1). By assessing the ease or difficulty of feeling these bones, you can estimate the fat stores of the sow. It is important to rely on more than one of these areas when assessing body condition. Different animals may deposit fat in differing degrees at different locations.

A condition score from 1 to 5 is assigned to each sow, based on the ease or difficulty of detecting bones at various pressure points. Figure 2 illustrates the physical appearance of sows for each condition score and describes the ease or difficulty of detecting the bones for each score. An approximate level of back fat associated with each condition score is given in Table 1. The goal is for sows to attain a condition score of 3 by mid-to-late gestation and to maintain that score until farrowing. Sows with a condition score of 3 at farrowing will enter the farrowing crate with adequate fat reserves to withstand a heavy lactation, but they will not be so overconditioned that they will experience farrowing difficulties or reductions in lactation feed intake. Sows entering the farrowing house with a condition score of 3 should eat well, milk well, and have a condition score of 2.5 at weaning, resulting in a prompt return to estrus. A realistic goal is to have all sows in a farrowing group with condition scores between 2.5 and 3 at farrowing, with 80% scoring 3.

Figure 1. Location of ribs, backbone, "H" bones, and "pin" bones on the sow.

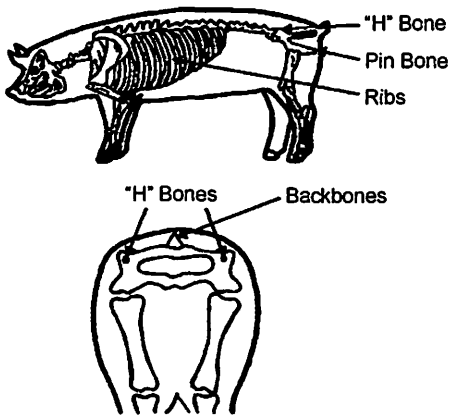


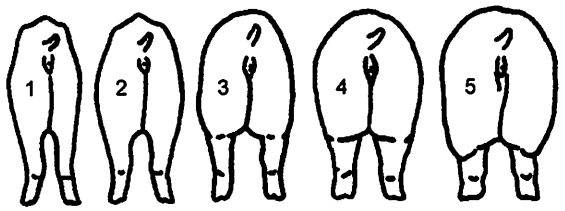
Table 1. Relationship between condition score and back fat level.

Condition Score	Approximate Level of Back Fat (Inches)
1	< 0.6
2	0.6 – 0.7
3	0.7 – 0.8
4	0.8 – 0.9
5	> 0.9

Frequency of Condition Scoring Sows

For best results, sows should be condition scored at mating and at least two additional times between breeding and farrowing. It is often convenient to combine condition scoring with other routine activities, such as pregnancy checking and vaccinations, to save time opening gates and positioning people to score sows. A typical procedure is to score sows at mating, on day 30 post-mating when sows are pregnancy checked, and about 80 days after breeding. Condition scores will be more accurate if two people score the sows and the resulting two scores are averaged. When this team approach is used, the same individuals should always score the sows so scoring will be consistent.

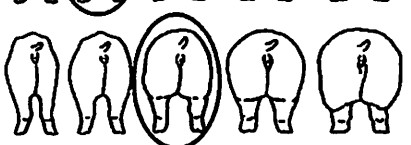
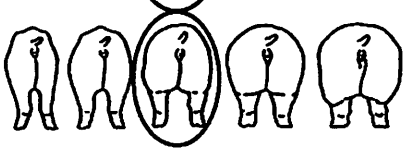
Figure 2. Body condition scores of sows.



Score	Condition	Detection of ribs, backbone, "H" bones, and "pin" bones
1	Emaciated	Obvious
2	Thin	Easily detected with pressure
3	Ideal	Barely felt with firm pressure
4	Fat	None
5	Overly fat	None

It is important to record condition scores so that monitoring the sow's progress is possible. One convenient way to document a sow's condition score is to record the score on her information card. Another option is to develop a card similar to that shown in Figure 3 and simply circle the drawing that best represents the sow's condition at the time of evaluation.

Figure 3. Example record card for recording the condition of a sow during gestation.

Time	Body Shape
Mating	
Day 30	
Day 80	

Number of Sows to Condition Score

It is generally best to condition score each sow individually, especially in herds with no recorded history of condition scoring, those in which sow condition is poor, and in herds that are experiencing reproductive difficulties. Once sow body condition within a herd has stabilized at a desirable level or a feeding management strategy has proven satisfactory, it may be sufficient to establish a condition score monitoring program rather than continuing to score all sows in the herd. For a monitoring program, at least 15 to 20% of the sows in each farrowing group should be condition scored.

Using Condition Scores to Adjust Feed Intake

When using body condition scores to adjust feeding levels for sows, it is important to define an operation's "base feeding rate." A base feeding rate represents the amount of feed which will allow a sow to gain the proper amount of weight and condition during gestation, assuming she has a condition score of 2.5 at mating and is not subjected to extreme environmental conditions. For most operations, a base feeding rate during gestation of 4.5 to 5 pounds per day of a corn-soybean meal diet is adequate.

During lactation, some sows may lose considerable body weight and condition, resulting in a condition score of lower than 2.5 at weaning. These sows will need more feed than the base feeding rate to achieve proper condition by the next farrowing. Other sows may be overconditioned at the time of weaning and will need less feed than the base feeding rate to achieve the desired body condition score by the next farrowing.

It is best to identify at the time of mating sows that will require more or less feed than the base feeding level in order to reach the target condition score by farrowing. The advantage of identifying these sows early in gestation is that ample time will be available to get them into proper condition. In general, it is best to condition sows during the first half to two-thirds of gestation so that large adjustments in feeding rates are not necessary close to farrowing.

Table 2 shows some guidelines that can be used to adjust the daily feed allowances of gestating sows based on their body condition score. Keep in mind that these adjustments are only guidelines. Animals on different farms may require more or less feed to achieve target condition scores based on their genetics, environmental conditions, and farm management practices.

Table 2. Guidelines for adjusting gestation feeding level based on condition score.

Condition Score	Feeding Level (Pounds)
1	Base feeding level + 2.0
2	Base feeding level + 1.0
3	Base feeding level
4	Base feeding level – 0.5
5	Base feeding level – 1.0

Summary

Sow condition scoring provides a more reliable method of assessing body condition than visual appraisal alone. Condition scoring of sows is a relatively simple process that can be used to determine the adequacy of gestation feeding levels and lactation feed intakes. Condition scores can also be used to provide guidelines for adjusting daily feeding rates during gestation so that each sow is in proper condition for farrowing and rebreeding. Maintaining sows in the proper condition will increase sow longevity and lead to more consistent reproductive performance.

12) BODY CONDITION SCORES

Michel A. Wattiaux
Babcock Institute

BODY CONDITION

The amount of body reserves a cow has at calving has a strong influence on potential complications at or immediately after calving, milk production and reproductive efficiency for the upcoming lactation. Cows that are too thin have:

- Reduced milk production due to lack of adequate body reserves to use in early lactation;
- Increased incidence of certain metabolic diseases (ketosis, displaced abomasum, etc.);
- Delayed resumption of heat cycle after calving.

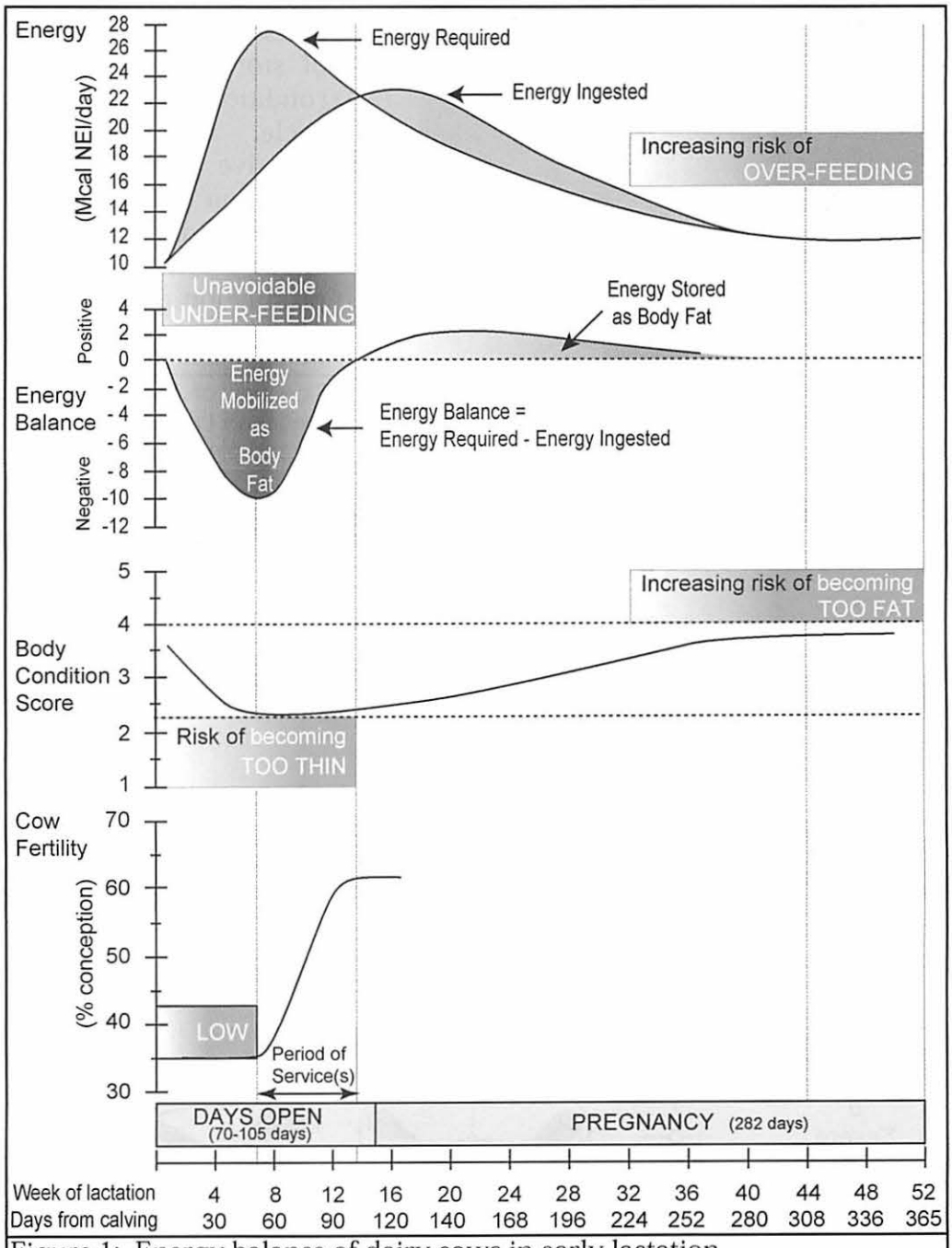


Figure 1: Energy balance of dairy cows in early lactation

On the other hand, cows that are too fat have:

- More complications at calving (difficult calving);
- Depression of voluntary dry matter intake in early lactation that predisposes the cow to:
  - — Increased incidence of certain metabolic diseases (fat cow syndrome, ketosis, etc.);
  - — Reduced milk production.

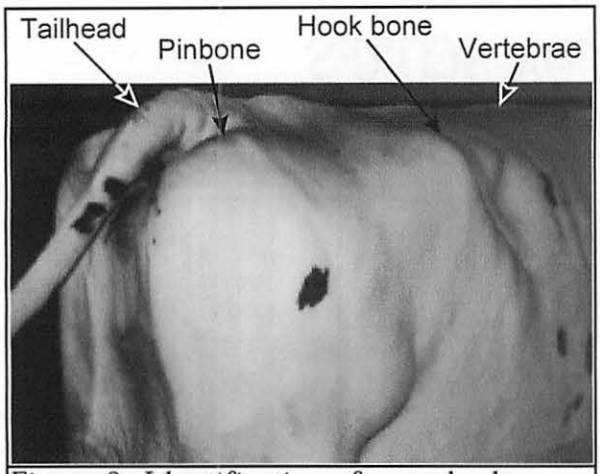


Figure 2: Identification of some body parts used to assign body condition scores

Thus the goal is to have cows in "good" condition at calving—not too thin and not too fat. Body condition is a subjective assessment of the amount of fat, or amount of stored energy, a cow carries. Body condition changes throughout the lactation cycle. Cows in early lactation are in negative energy balance and losing body condition (mobilizing body reserves). For every kilo of body weight mobilized, enough energy is supplied to support the production of seven kilos of milk. Early

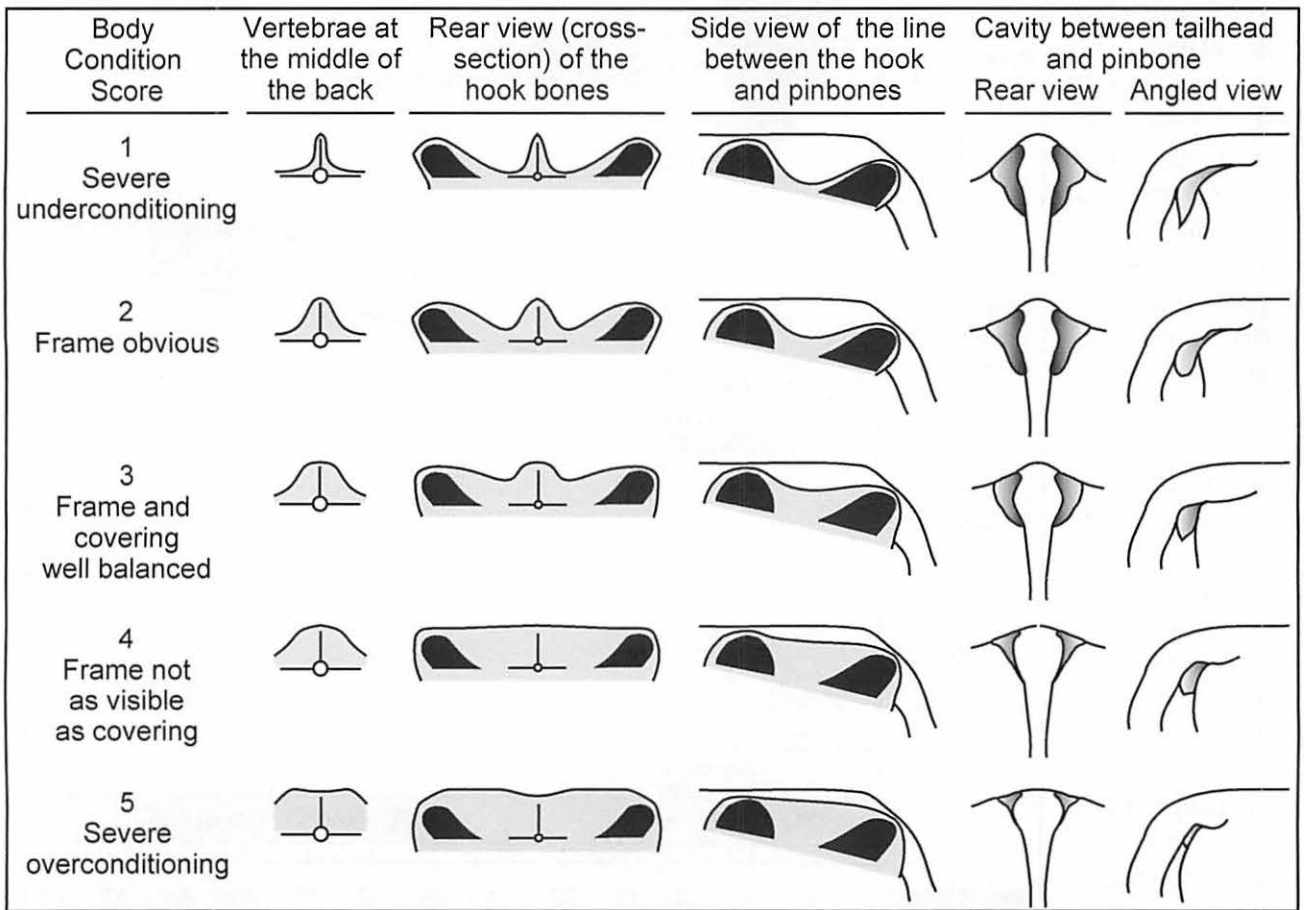


Figure 3: Body condition scores (Adapted from A.J. Edmondson, I.J. Lean, C.O. Weaver, T. Farver and G. Webster. 1989. A body condition scoring chart for Holstein dairy cows. J. Dairy Sci. 72:68-78.)

lactation cows should not lose more than about one kilo of body weight per day. In contrast, cows in late lactation are in positive energy balance and gain body condition to replenish the body reserve lost in early lactation. Thus the "ideal" body condition changes over the stages of a lactation (Figure 1).

BODY CONDITION SCORE (BCS) THROUGHOUT LACTATION

Body condition score is a tool used to adjust feeding and management practices in order to maximize the potential for milk production and minimize reproductive disorders.

A body condition score is assigned by visual observation of the cow's rump area—primarily the region delimited by the hip bones (*tuber coxae*), the pinbones (*tuber ischii*) and the tailhead. The amount of "covering" over the vertebrae of the back is also used in giving a score (Figures 2, 3 & 4). Cows are usually ranked on a scale from 1 to 5. Extremely thin cows are assigned a score of 1 and extremely fat cows, a score of 5 (Figure 4).

A body condition score of 1.5 one or two months after calving is not desirable because it indicates severe lack of adequate nutrition (negative energy balance, Figure 4a). A body condition score of about 3.0 (Figure 4b) should be typical of a cow recovering body reserves in mid-lactation. In late lactation and during the dry period, a body condition score of 3.5 may be the most desirable.

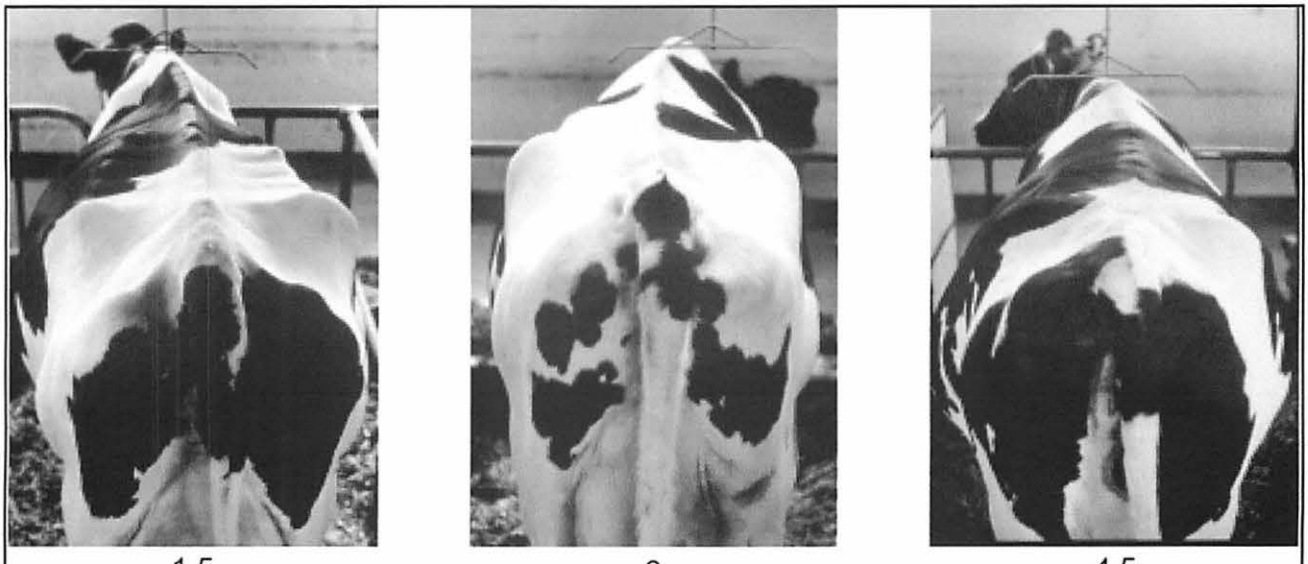
Table 1: Effect of body condition score (BCS) losses in early lactation on conception rate

Loss in BCS	Conception rate
Less than 1 unit	50%
From 1 to 2 units	34%
More than 2 units	21%

Recommended body condition scores at various stages of lactation are:

Calving	**3.0 to 3.5**
Breeding	**2.5**
Late lactation	**3.0 to 3.5**
Dry period	**3.0 to 3.5**

This body condition score gives the cow sufficient body reserves to minimize the risk of complications at calving while maximizing milk production in early lactation. As milk production declines in late lactation, cows gain body weight efficiently. Overfeeding concentrate is a



1.5 3 4.5

Figure 4: Examples of cows with body condition scores of 1.5 (A), 3 (B), and 4.5 (C)

common management mistake. Cows fed too much concentrate in the later part of lactation tend to become obese (Figure 4c). These cows are likely to have difficult calving and to develop other disorders (fat cow syndrome).

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Beef Cow Condition Scoring

Michael L. Westendorf, Ph.D., Extension Specialist in Animal Science & Robert C. Mickel, Hunterdon County Regional Livestock Agent

Profitability in the cow-calf business is greatly influenced by the percentage of cows calving every 12 months. Proper nutrition 45 to 60 days before and 90 days after calving is the most critical factor in the cow's ability to rebreed and maintain a 365-day calving interval. If cows are underfed during this period, they will take longer to begin to go into heat and longer before they have their next calves.

Because the relation between nutrition and reproductive performance is so important, beef producers need a quick, reliable way to evaluate whether each cow is in proper condition. Such a method, called Beef Cow Condition Scoring, exists. It enables you to assess body condition and judge its adequacy. Once you arrive at condition scores for each animal, these scores can help you plan supplemental feeding programs to maintain productivity. This factsheet describes a scoring system that can be effectively used to assess body condition, to determine whether cows are too thin or too fat and to make feeding and management decisions.

Importance of Body Condition

Beef cows must:

- have a healthy body,
- produce milk for the calf,
- rebreed for another calf, and
- in the case of heifers, continue growing.

How well the cow or heifer meets these expectations partly depends on her genetic capabilities, but environment is even more important. Nutrition is the environment's most important component. A cow underfed over a long period will lose weight, both fat and muscle. If underfeeding continues the cow's body will take drastic measures to conserve available nutrients. If she is nursing a calf and not yet rebred, her ovaries will become reproductively "dormant" and remain so until nutrition improves. Such cows will not exhibit estrus or rebreed during these periods. If a cow continues to lose body weight and if energy is not provided, she will gradually produce less milk, and at the extreme, stop producing entirely. When the cow's energy out-go exceeds the intake, certain functions begin to cease in this order: the cow first loses weight, then ceases to reproduce, lessens milk production and ultimately dies.

Body Condition Scores are numbers used to suggest the cow's relative fatness or thinness. Most often a scoring range of 1 to 9 is used, with a score of 1 being very thin and 9 extreme fatness. A thin cow is very sharp, angular and bony, while a fat one is smooth and boxy with bone structure hidden from sight or touch. The figures on the inside of this fact sheet describes the 1-9 condition scoring standards. For scores to be more helpful, producers need to adapt the system to their own conditions. The following table describes how reproductive performance may vary as body condition changes.

Table 1. Rebreeding and Condition Scoring of Beef Cows

Item	Condition Score at Calving			
	4	5	6	7
Cows Pregnant After First Breeding	4%	15%	36%	65%
Cows Pregnant After 60 days of Breeding	24%	51%	69%	87%

(From: Ritchie, H.D.)

Obese cows also have liabilities. One research study (*Arnett, et al.*) compared 24 twins, half which were fed very high energy levels to induce fatness, and half fed recommended energy levels. These twins were then studied when they calved. Fat cows required more help at calving, lost more calves and had shorter productive life spans than did the cows normally fed. In addition, milk production was

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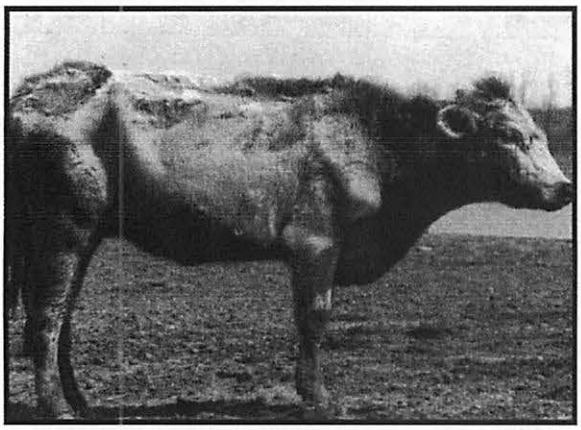
Table 2. Body Condition Scoring (BCS) for Beef Cows

Group	BCS	Description
Thin Condition	1	**Emaciated,** Emaciation with no fat detectable over spine, hips, or ribs. Tailhead and ribs project prominently.
	2	**Poor,** still emaciated but tailhead and ribs are less prominent. Spine still sharp but there is some tissue over the spine.
	3	**Thin,** ribs still identifiable but not as sharp to the touch. Some fat along the spine and over the tailhead.
Borderline Condition	4	**Borderline,** individual ribs no longer obvious. The spine is still prominent but feels round rather than sharp. There is some fat cover over the ribs and hip bones.
Good Condition	5	**Moderate,** good overall appearance. Fat cover over the ribs feels spongy and areas on either side of the tailhead have fat cover.
	6	**Moderate plus,** firm pressure must be applied to feel the spine. A high amount of fat is present over the ribs and around the tailhead.
	7	**Good,** cow appears fleshy and carries some fat. Spongy fat cover over the ribs and around the tailhead. Fat patches are becoming obvious.
Fat Condition	8	**Fat,** fleshy and overconditioned. Spine almost impossible to palpate. Large fat deposits over ribs, around tailhead, below vulva. Patchy fat.
	9	**Extremely fat,** wasty, patchy, and blocky. Tailhead and hips buried in fat. Bone structure no longer visible. Animal's mobility possibly impaired.

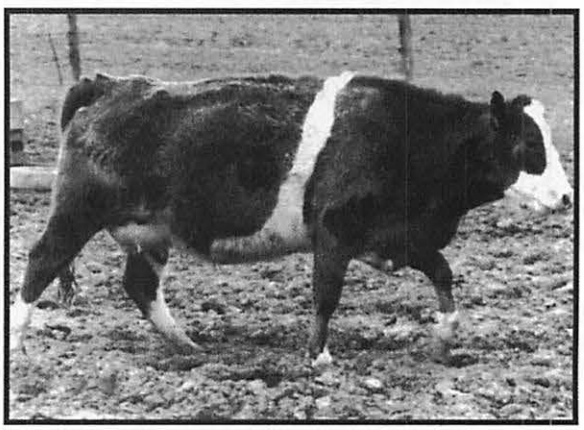
(Adapted from Richard, et al., 1986)



BCS-1

BCS-2

BCS-3



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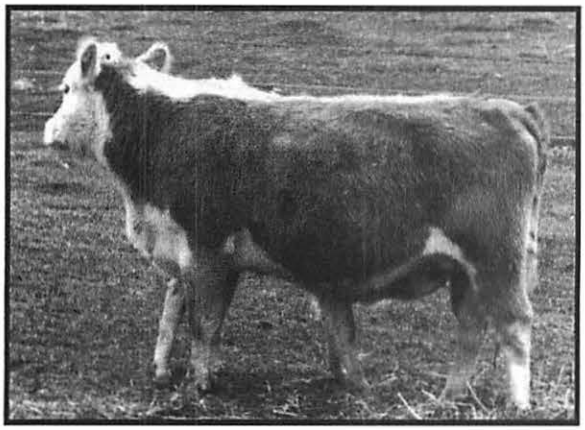
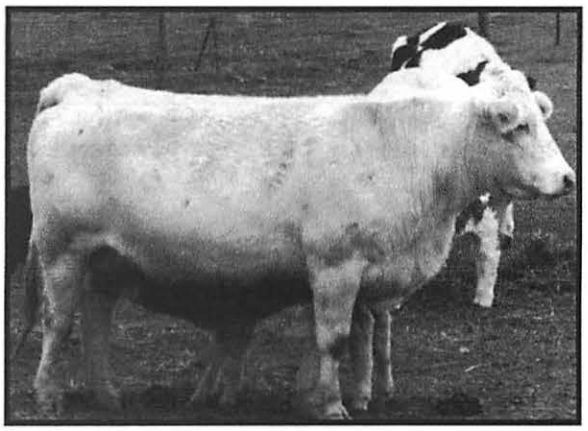
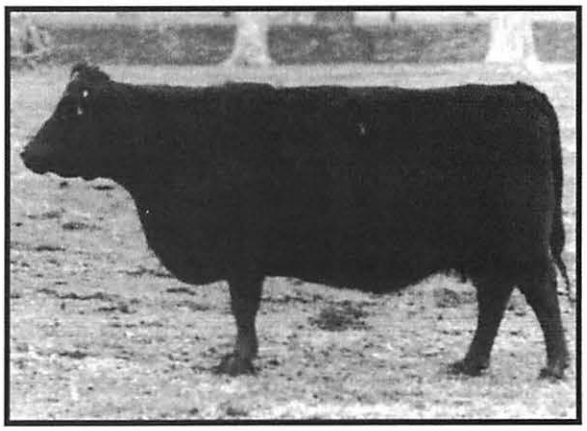


BCS-5

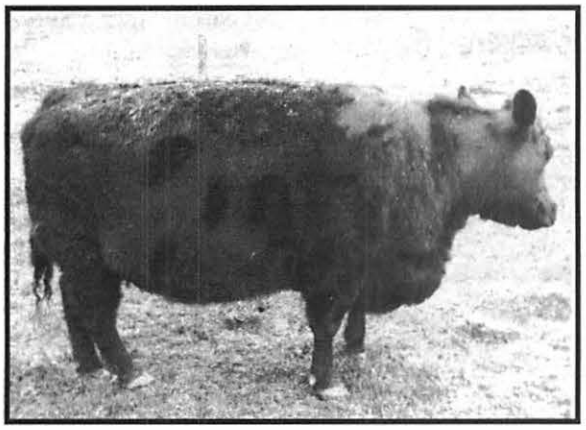


BCS-6

BCS-7



BCS-8



BCS-9

(Pictures from Westendorf, et al.)

decreased and services per conception were increased in the obese cows. Overconditioning or obesity is primarily a problem in heifers that become overfat while they are growing and developing. It is less serious in mature cows. However, since fat cows are more expensive to maintain, obesity is uneconomical and may indicate overall production deficiencies.

Using Body Condition Scores

Although the range of body condition scores runs from 1 to 9, it may be easier to narrow this group to manageable ranges such as thin, borderline, good, and fat cows. Scoring should be done at least twice a year, preferably at weaning and three months prior to each cow's respective calving date or calving period. This method seems to work best, as you identify thin or borderline condition cows and feed them accordingly to get them back to the good or 5 to 7 range before calving. A Body Condition Score of 5 should always be seen as a minimum

acceptable level of condition necessary for rebreeding. At the same time you will identify over-conditioned cows and, if possible, manage them as a separate group. Once you implement a Body Condition Scoring System, you will find yourself mentally scoring your cows more often than the suggested twice a year scoring.

Planning Supplemental Feeding Programs Using Body Condition Scores

The cow's body condition, lactation status and quality of forage are major factors to consider in planning a supplemental feeding program. Remember that other factors also influence nutritional requirements, such as weight, mature size, breed type, milk production level and weather conditions.

As you plan your supplemental feed program, consider the 45-60 days before calving as critical for ensuring that nutrient requirements are met. Roughing dry cows through the winter is practical if it is recognized that the cow needs to gain the weight of the fetus she is carrying plus any condition required to attain the good or 5-7 Body Condition Score range at calving.

Remember that early spring pasture alone is often inadequate to meet the needs of a cow nursing a calf, especially if the cow was in poor condition at calving or if the cow is very young. Forages usually contain enough protein to meet cow requirements. However, certain cows need energy supplementation in the form of corn or some other concentrate feed:

- young cows,
- cows in poor condition, and
- cows consuming low quality forage.

If you use a protein supplement, a product high in natural protein is preferred over a non-protein nitrogen source. For mineral and vitamin supplements, the animal's body condition does not make much difference. In all situations, use mineral supplements with emphasis on salt, phosphorus, magnesium, copper, zinc, calcium and selenium. With excellent forage, vitamin A supplements may not be needed, unless you are using hay stored for a long period of time. Use vitamin A supplements for lactating cows consuming lower quality forages, regardless of their body condition.

Conclusion

Calving and rebreeding are stressful times when adequate nutrition is essential for timely rebreeding. Cows that are too thin at calving will take longer to rebreed and may only rebreed after months of supplemental feeding. Avoid having cows too fat or too thin. Rather, try to have your cows attain scores of 5-7 at calving (on a 1 to 9 scale). You can use these condition scores to make decisions about supplemental feeding and to group cows by condition for feeding.

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12) BODY CONDITION SCORES

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BODY CONDITION

The amount of body reserves a cow has at calving has a strong influence on potential complications at or immediately after calving, milk production and reproductive efficiency for the upcoming lactation. Cows that are too thin have:

- Reduced milk production due to lack of adequate body reserves to use in early lactation;
- Increased incidence of certain metabolic diseases (ketosis, displaced abomasum, etc.);
- Delayed resumption of heat cycle after calving.

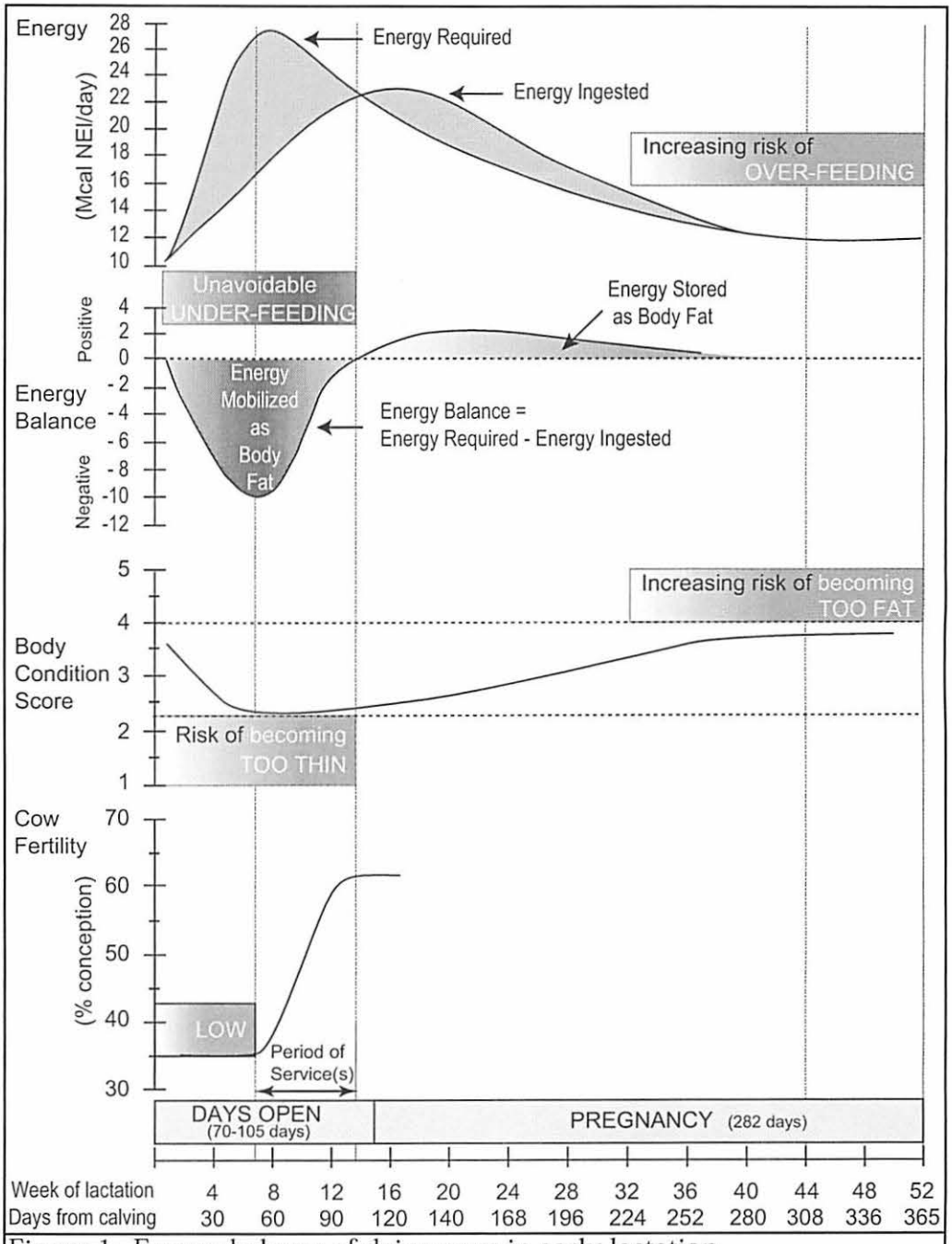


Figure 1: Energy balance of dairy cows in early lactation

On the other hand, cows that are too fat have:

- More complications at calving (difficult calving);
- Depression of voluntary dry matter intake in early lactation that predisposes the cow to:
  - — Increased incidence of certain metabolic diseases (fat cow syndrome, ketosis, etc.);
  - — Reduced milk production.

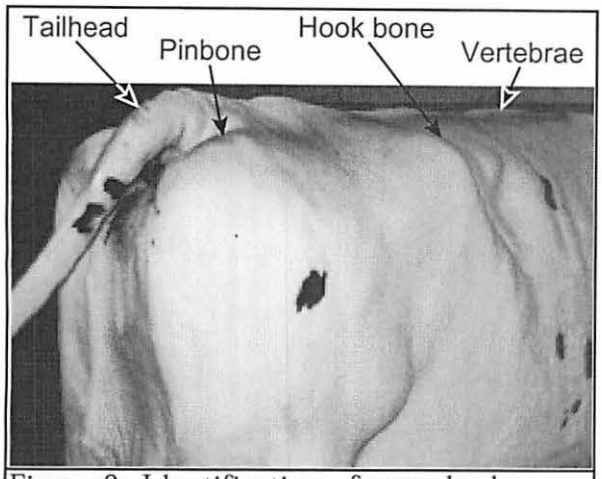


Figure 2: Identification of some body parts used to assign body condition scores

Thus the goal is to have cows in "good" condition at calving—not too thin and not too fat. Body condition is a subjective assessment of the amount of fat, or amount of stored energy, a cow carries. Body condition changes throughout the lactation cycle. Cows in early lactation are in negative energy balance and losing body condition (mobilizing body reserves). For every kilo of body weight mobilized, enough energy is supplied to support the production of seven kilos of milk. Early

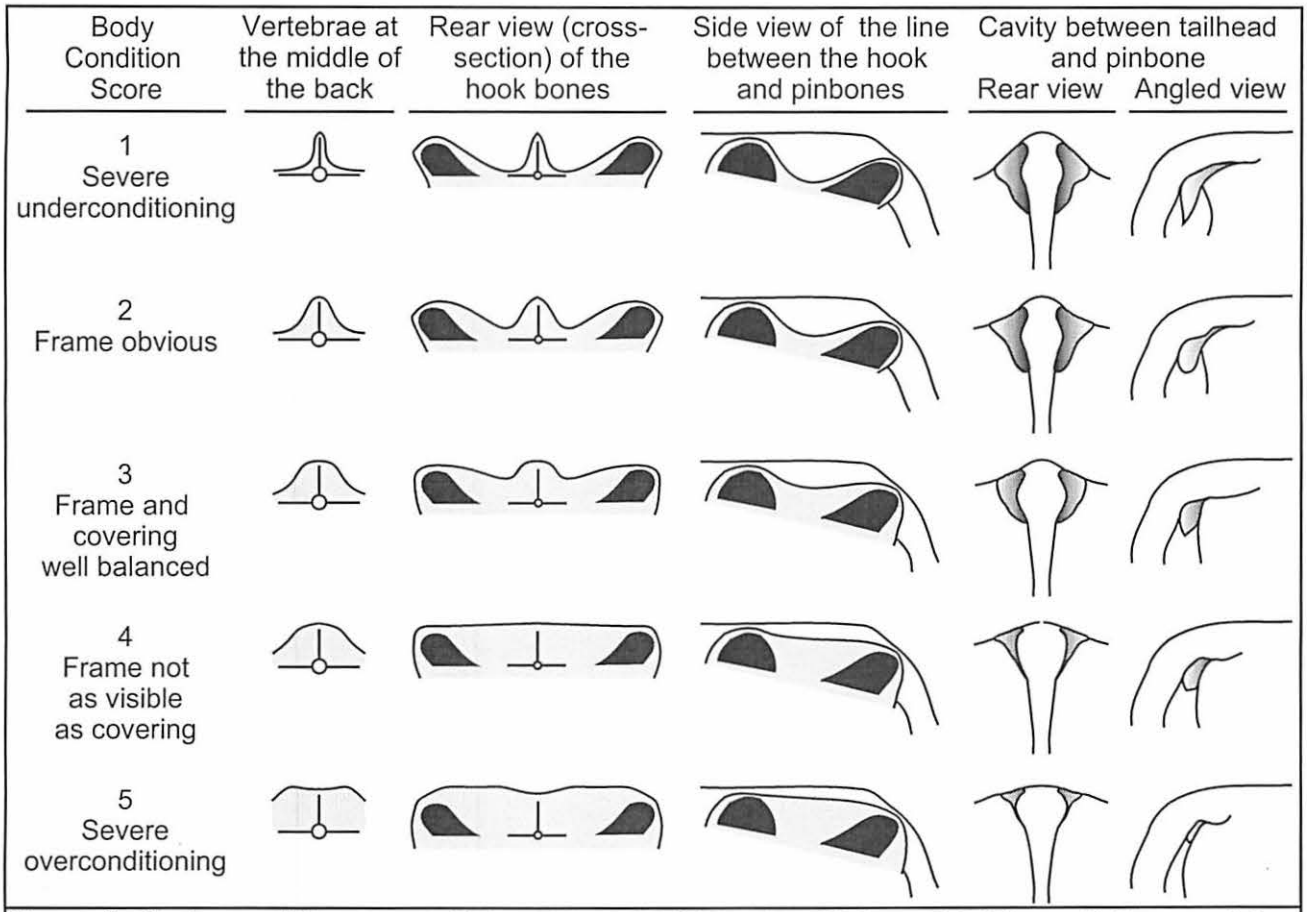


Figure 3: Body condition scores (Adapted from A.J. Edmondson, I.J. Lean, C.O. Weaver, T. Farver and G. Webster. 1989. A body condition scoring chart for Holstein dairy cows. J. Dairy Sci. 72:68-78.)

lactation cows should not lose more than about one kilo of body weight per day. In contrast, cows in late lactation are in positive energy balance and gain body condition to replenish the body reserve lost in early lactation. Thus the "ideal" body condition changes over the stages of a lactation (Figure 1).

BODY CONDITION SCORE (BCS) THROUGHOUT LACTATION

Body condition score is a tool used to adjust feeding and management practices in order to maximize the potential for milk production and minimize reproductive disorders.

A body condition score is assigned by visual observation of the cow's rump area—primarily the region delimited by the hip bones (*tuber coxae*), the pinbones (*tuber ischii*) and the tailhead. The amount of "covering" over the vertebrae of the back is also used in giving a score (Figures 2, 3 & 4). Cows are usually ranked on a scale from 1 to 5. Extremely thin cows are assigned a score of 1 and extremely fat cows, a score of 5 (Figure 4).

A body condition score of 1.5 one or two months after calving is not desirable because it indicates severe lack of adequate nutrition (negative energy balance, Figure 4a). A body condition score of about 3.0 (Figure 4b) should be typical of a cow recovering body reserves in mid-lactation. In late lactation and during the dry period, a body condition score of 3.5 may be the most desirable.

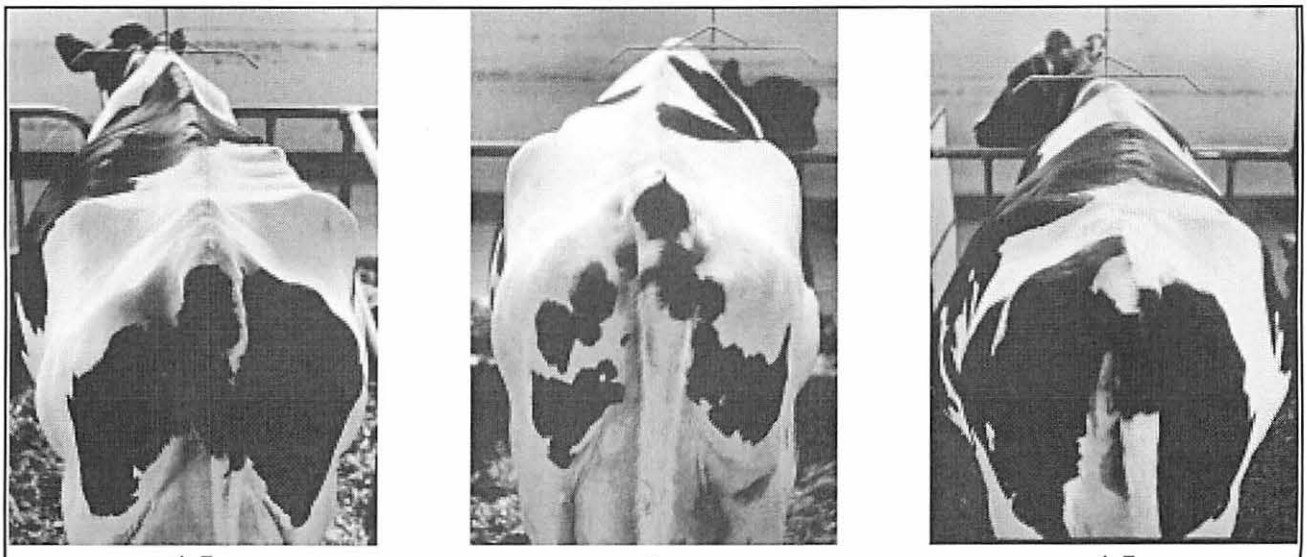
Table 1: Effect of body condition score (BCS) losses in early lactation on conception rate

Loss in BCS	Conception rate
Less than 1 unit	50%
From 1 to 2 units	34%
More than 2 units	21%

Recommended body condition scores at various stages of lactation are:

Calving	**3.0 to 3.5**
Breeding	**2.5**
Late lactation	**3.0 to 3.5**
Dry period	**3.0 to 3.5**

This body condition score gives the cow sufficient body reserves to minimize the risk of complications at calving while maximizing milk production in early lactation. As milk production declines in late lactation, cows gain body weight efficiently. Overfeeding concentrate is a



1.5 3 4.5

Figure 4: Examples of cows with body condition scores of 1.5 (A), 3 (B), and 4.5 (C)

common management mistake. Cows fed too much concentrate in the later part of lactation tend to become obese (Figure 4c). These cows are likely to have difficult calving and to develop other disorders (fat cow syndrome).