

Implementation of a Body Condition Scoring Program in Dairy Herds

Penn Conference 1996

James D. Ferguson
Associate Professor
Center for Animal Health and Productivity
University of Pennsylvania, School of Veterinary Medicine

Introduction

Body condition scoring is subjective measure of body fat stores (3,11). Typical systems that use a scale of 1 to 5 to body score cows (11). A cow with a condition score 1 is considered emaciated, 2 is thin, 3 is average, 4 is fat, and 5 is obese. Often this scale will be divided into quarter point increments (1,3). Because of the subjective nature of body condition scoring, concerns arise about the repeatability of body condition scoring between observers. In addition there are questions about the relativity of body condition scoring as it relates to body composition and energy balance. For those reasons there are questions about its utility as a management tool in dairy herds. This paper will attempt to address these issues and describe implementation of a body condition scoring program in dairy herds.

Quantifying Body Condition Score

Otto et al. (9) examined carcass composition in relation to body condition score in Holstein dairy cows. These researchers found that one unit change in body condition was equivalent to 56 kg of body weight. In addition, body composition correlated with body condition score. Body fat increased +12.65% for every increase in unit in body condition score and body protein decreased -12.19% for each unit increase in body condition score. Total carcass dry matter increased 7.23% for each unit increased in body condition score. This work demonstrated that body condition score correlated with body composition and was a useful tool in the field to assess carcass composition. Other workers have also found good correlation between body condition score (BCS) and carcass composition (12,13).

One Body Condition Loss	Item
Tissue Mobilized	56 kgs (40-77 kgs)
Cumulative Negative Energy	-400 Mcal (-300 to -500)
Average Condition Loss-Group	-.5 Units
Time to Maximum Loss	30 Days post-calving (4-6 weeks)
Time to Begin to Increase in Condition	50-70 Days post-calving
Optimum Condition at Calving	3.0 to 3.5

Ferguson et al.(3) examined body condition change in relation to energy balance in 43 high producing Holstein dairy cows. These cows were fed ad libitum diets for maximal dry matter intake. Ferguson et al. found that body condition score change correlated with cumulative negative energy balance, with one unit of body condition loss was equivalent to 400 mcal cumulative negative energy balance. This amount of cumulative negative energy balance represents 1200 lbs. of milk produced from fat mobilization. Body condition change is reflective of change in carcass composition and also energy utilization in Holstein dairy cows and thus can serve as a useful proxy in the field for assessing energy management.

In these cows body condition loss was maximal by 4 to 6 week post-calving and averaged about a 1/2 a unit of body condition score. Milk production did not influence body condition loss. Body condition began to increase by 12 weeks post-calving. Ruegg and Milton (10) observed larger losses in BCS in 13 herds about .8 units and over a longer extent, 50 to 80 days. However in experiments where we have provided ad libitum diets we have typically observed cows lose about 1/2 a score by 30 days post-calving. It is a reasonable expectation within commercial dairy herds that most cows will lose less than 1 unit body condition score by 30 days post-calving and should begin repletion by 70 to 90 days post-calving. Milk production is not correlated with body condition loss (3,4,5,10).

Examining the repeatability of body condition scoring between observers, Ferguson et al.(2) found that repeatability was about 56%, that is 56 % of the time observers gave the same score to the same cow. An additional 34% of the time observers gave a plus or minus quarter score to the same cow. Thus 90% of the scores deviated by either zero or a quarter point unit. Scores between observers were highly correlated from .89 to .93 We have found relationships to be similar within an individual repeatedly body condition scoring the same cows within a day or two. The individual will agree within himself or herself 50 to 60% of the time and then 40 to 30% of the time deviate by about a quarter unit in score from their previous observation. Therefore typical noise in body condition scoring is about a quarter of a point between individuals scoring similar cows at similar periods of time. It is possible to separate cows by .25 units between BCS 2.25 to 4.00 despite the variability in BCS.

We have attempted to simplify BCS by identifying principal descriptions of body conditions score (2). A principal descriptor between cows that body condition score above a 3 and a 3 or below is the appearance of the rump. Cows that body score 3 or less will have a “V” appearance between the hookbone, the thurlbone, and the pinbone whereas cows that body condition score a 3.25 or higher will have a “U” appearance in this region. Cows that body condition score 3 or less then are defined on the appearance of the hook and pinbones as to the degree of roundness and angularity related to the fat pad covering these points.

Cows that become too thin in body condition are cows that drop below a 2.5 in body condition score. These cows have no fat pad covering the pinbone. The pinbone will palpate as skin covering bone.

Principal Descriptors of Body Condition Score			
“Too Fat”	>4.00	Loin, Rump, Spine	Appearance
	4.00	Buried in Fat (Flat)	Buried in Fat
	3.75	Partially Visible	Invisible-Buried in Fat
	3.50	Visible	Partially Visible

Principal Descriptors of Body Condition Score			
	3.25	Visible	Visible
Rump	“U”	Sacral Ligament	Coccygeal Ligament
	“V”	Hook Bones	Pin Bones
“Too Thin”	3.00	Round (Fat Pad)	Round (Fat Pad)
	2.75	Angular	Round
	2.50	Angular	Angular (Palpable Fat Pad)
	<2.50	Angular	Angular (Skin & Bone)
	<2.50	Loin Processes	Spine Appearance

Likewise, the appearance of the sacral ligament and the tail head ligament are used to define body condition score in cows 3.25 quarter and higher. The sacral and Coccygeal ligament will be distinctly visible in cows that are 3.25 in body condition score. The tail head ligament tends to disappear before the sacral ligament as cows increase in body condition. Cows that are ideal body condition in the dry lot are cows which have a “U” at the rump have a fairly visible Coccygeal ligament and a distinctly visible sacral ligament. As cows approach a body condition 4, the sacral ligament disappears and these cows move into the too fat range. Cows are too fat when the pelvic ligaments are buried in fat.

Optimal Body Condition

Ideal body condition is a range and is a function of stage of lactation (5,6). Dry cows need sufficient body reserves to support early lactation milk production when energy intake lags energy output in milk. However, it has been repeatedly observed that fatter dry cows lose more body condition and have lower dry matter intakes (5,6,10). In addition, fat cows are at risk for metabolic problems after calving (8). Thus over conditioning is to be avoided. Reasonable body condition at calving would be that which provides sufficient reserves without depressing intake. Optimal dry cow body condition score should be above a 3.00 and below a 3.75. The risk of post parturient problems may be avoided when dry cows score a 3.25 to 3.50. Body condition loss in the dry period has been associated with increased dystocia and culling, thus it is to be avoided (7).

In early lactation, cows will lose body condition. Body condition loss should be less than 1 unit, thus early lactation cows should be above a 2.50 in condition. Body condition loss should be maximal by 4 to 6 weeks. Cows in the first 100 to 120 days of lactation should score between a 2.50 to 3.25. Body condition repletion should begin by 7 to 12 weeks at a modest rate. We have observed rates of about .2 body condition units per 6 weeks. Ruegg and Milton (10) observed rates of .13 units every 6 weeks. Body condition score between 200 DIM and dry off should be between 2.75 and 3.50. Feeding management should ensure cows dry off between at a 3.25 to 3.50. This requires feeding cows based on body condition score and milk production.

Milk production and parity do not significantly effect body condition loss. Cows with disease problems lose slightly more condition than cows with no problems, about .25 units (10). BST

injections, changing from 2x to 3x milking or 3x to 4x milking cause a slight BCS drop of .25 units in a 30 day period until dry matter intake increases.

Implementing a Body Condition Scoring System

There are several dimensions to body condition scoring within dairy herds. One dimension to body condition scoring is the change in condition with stage of lactation. A second dimension to body condition scoring is the body condition of the herd this month compared to last month. A third dimension to body condition scoring is the body condition compared between groups of animals on the farm. Body condition between groups may reflect stage of lactation, depending on grouping criteria on the farm. Each of these dimensions requires different “costs” in terms of data collection.

Body condition can be followed for each individual cow from the dry period through lactation. This would mean creating a system to track an individual animal through time and aggregating these changes to form a herd average body condition score profile. This would require body condition scoring on a frequency that would capture changes in condition in each cow at critical stages of lactation. This data would then need to be keyed into a database in order to aggregate the information across time. This would allow us to examine body condition change as a function of lactation. This is a time consuming process and may not be necessary to examine body condition change in a dairy herd.

Another approach to body condition scoring would be to collect scores from all cows or a sampling of cows this month. The range distribution and mean score could be compared to the distribution and mean score last month to assess change in herd body condition status. This would allow us to look at changes in BCS of the herd as a function of seasonal activities. This may indicate times when management and facilities were not supporting cow performance.

A third aspect of body condition scoring would be to look at body condition based on outliers. This would involve body condition scoring the herd or groups within the herd and determining how many cows are below or above acceptable limits. These limits maybe defined as cows “too thin” or “too fat.” Cows that are too thin are cows which are below a 2.5 in body condition score. Cows which are too fat are above a 3.5 in body condition score. If cows are between these two points then body condition score is acceptable. We may assess the body condition of a herd based on the percentage of outliers observed at point in time. Depending on the farm grouping scheme, this system would capture changes in lactation and changes with season for BCS.

Body condition outliers are defined as cows below a 2.5 and above a 3.5 for the following reasons. Cows which are below a 2.5 have mobilized most of their body fat reserves located in subcutaneous, intermuscular and omental spaces. Body fat is still present within muscle bundles and internal organs such as heart, liver and kidney. These cows have very little fat reserves to meet any additional energy demands in lactation. Cows that are defined as too fat are those that are above a 3.5 because these cows have been shown to have depressed dry matter intakes at calving. These cows will lose more body condition than cows which are 3.5 or lower in body condition at calving. This puts these cows at risk for metabolic problems.

We may approach body condition scoring by ranking the percentage of cows that are too thin or too fat. All other cows would be at some optimal body condition. For the dry cows, cows too thin are below 3.00 and cows too fat are above a 3.50. The rest of the cows must be acceptable in BCS. We typically will accept 10-15% of the group being outside the normal range. There will always be cows with problems, either long calving intervals or short calving intervals or other problems so that some

cows won't conform to acceptable standards. In general 70-80% of the cows should fall within the ideal range. If the percentage of cows above or below the ideal range increases above 15%, then corrective measures need to be employed.

Similarly, we can define cows that are too thin and too fat for lactating cows. Cows in lactation that would be too thin would be those who are below a 2.5. Again if more than 10-15% of the herd is below a 2.5, too many cows are too thin. We then can make an assessment if the herd has more cows that are too thin than we would like to see, and try to identify who those cows are. If a majority of dry cows are in acceptable BCS and more than 15% of lactating cows are below a 2.5, then BCS loss is too high.

Cows that are a 3.25 or higher and in early lactation or in the high group are too fat. These cows would need to be moved to a lower production group so that they don't gain too much condition before dry off. Cows that are body score 3.25 to 3.5 that are in a middle group should be moved to a low group to prevent over conditioning. Cows in late lactation should be targeted that they dry off at about a 3.5 in body condition score. If cows in the high group are 3.25 and higher and in early lactation, insufficient loss is a problem.

By looking at cows that fall outside normal ranges monthly, we can very quickly gain a sense of extremes, either body condition loss or body condition increase within a dairy herd. This allows us to rapidly body score a herd. The mean condition of the group will have to conform to expectations if extremes less than 15%. If there are more than 15% of cows in the extreme categories, we know there is a problem. If we identify the cows that are too thin or too fat by writing down cow ID's we can look more closely at who comprises these groups. If thin cows are entirely high producing cows then we need to investigate if the nutritional management is not adequately supporting high milk production. High producing cows should not lose more body condition than lower producing cows. If the cows that are thinner are first lactation animals then maybe first lactation cows should be separated or feeding program changed for this group. If cows which are thinner are cows that have had health problems then we need to look at better prevention of periparturient problems so that less than 15% of the herd is falling into the too thin category. Additionally may be too thin cows are present because of seasonal environmental problems.

Likewise, if more than 15% cows are too fat we need to look at who they are. If the cows that are too fat are identified as cows with long days open then we need to do a better job in breeding management. Possibly BST would be an opportunity to decrease over conditioned cows with long days open. If cows are too fat, yet have acceptable days open, we need to look at creation of other lactating production groups to prevent over conditioning or examine energy protein relationships in the ration.

We find this system of monitoring herds by assessing extremes fairly simple and easy to implement for herds of all sizes. In addition it is easy to communicate to producers cow that are at the extremes in body condition. We can tell producers that we want dry cows to have "U's" at the rump and visible pelvic ligaments. This means that cows will be 3.25 or 3.50 in the dry group. In early lactation we want cows to have a "V" at the rump and a fat pad on the pinbone. They are too thin there is only skin and bone on the pinbone. When herds are having problems, when more outliers are found than is acceptable, body condition scoring may need to be done on a bi-weekly or tri-weekly basis to follow response to recommendations. Since typical "noise" in body condition scoring is a quarter point it is difficult to assess changes week to week. Therefore at least a bi-weekly re-check in herds that have had problems if reasonable. In herds that have a lot of fat cows, it will be difficult to effect much change on that farm until cows calve. Fat cows must be maintained in that status until calving. They should be monitored closely for condition loss in the dry lot and for health problems post-

calving. Then breeding and feeding programs should be put in place to prevent over conditioning in the next lactation.

References

1. Domecq JJ, Skidmore AL, Lloyd JW, Kaneene JB. Validation of body condition scores with ultrasound measurements of subcutaneous fat of dairy cows. *J Dairy Sci* 1995;78:2308-13.
2. Ferguson JD, Galligan DT, Thomsen N. Principal Descriptors of Body Condition Score in Dairy Cattle. *J Dairy Sci* 1994;77:2695-703.
3. Ferguson, JD and KA Otto. *Managing Body Condition in Dairy Cows*. Cornell University; 1989; Ithaca, NY. 1989; 75 p. Proceedings of the 1989 Cornell Nutrition Conference for Feed Manufacturers.
4. Garnsworthy PC, Jones GP. The influence of body condition at calving and dietary protein supply on voluntary food intake and performance in dairy cows. *Anim Prod* 1987;44:347-53.
5. Garnsworthy PC, Topps JH. The effect of body condition of dairy cows at calving on their food intake and performance when given complete diets. *Anim Prod* 1982;35:113-9.
6. Gearhart MA, Curtis CR, Erb HN, Smith RD, Sniffen CJ, Chase LE, Cooper MD. Relationship of changes in condition score to cow health in Holsteins. *J Dairy Sci* 1990;73:3132
7. Morrow DA, Hillman D, Dade AW, Kitchen H. Clinical investigation of a dairy herd with the fat cow syndrome. *J Am Vet Med Assoc* 1979;174:161-7.
8. Otto KA, Ferguson JD, Fox DG, Sniffen CJ. Relationship between body condition score and composition of ninth to eleventh rib tissue in Holstein dairy cows. *J Dairy Sci* 1991;74:852-9.
9. Ruegg PL, Milton RL. Body condition scores of Holstein cows on Prince Edward Island, Canada: Relationship with yield, reproductive performance, and disease. *J Dairy Sci* 1995;78:552-64.
10. Wildman EE, Jones GM, Wagner PE, Bowman RL. A Dairy cow body condition scoring system and its relationship to selected production characteristics. *J Dairy Sci* 1982;65:495
11. Wright IA, Russel AJF. Estimation in vivo of the chemical composition of the bodies of mature cows. *Anim Prod* 1984;38:33
12. Wright IA, Russel AJF. Partition of fat, body composition, and body condition scoring in mature cows. *Anim Prod* 1984;38:23-32.