Albanian j. agric. sci. 2013;12 (3): 367-373

Agricultural University of Tirana

RESEARCH ARTICLE

(Open Access)

Evaluated body condition score (bcs) in puerperal period

ILIR DOVA [1], ANA KAPAJ[2], ENKELEDA OZUNI[1] IMER HAZIRI [3]

[1]Faculty of Veterinary Medicine, Agricultural University of Tirana, Albania

[2]Faculty of Economy and Agribusiness, Agricultural University of Tirana, Tirana, Albania

[3]Faculty of Agricultural and Veterinary,University of Prishtina,Kosovo

Abstract:

BCS provides an important evaluation of the energy status of cows in puerperal period. This evaluation method provides a subjective indication of the fat cover on cows. To evaluate BCS is used a scoring point system based on the fat deposited in external part of the cow. In this study to evaluate BCS in cows in different farms we used 1 to 9 scoring system. The data shows different BCS classes between cows in different farms. All farms included in study shows that the BCS level is lower than the ideal BCS. This proves that all farms involved in the study have a level of feeding which is not optimal. In the period up to 2 months after calving is observed a gradual reduction of BCS in dairy cows.

Keywords: BCS; puerperal period, scoring system

1. Introduction

Evaluation of BCS was not established as clear method till 1970 [14].Cow's live weight change is used as indicator energetic reserves early [9,16,30]. But live weight as indicator has some inconveniences, especially during transition period. Inconveniences are that energetic reserves like adipose tissue in internal organs do not change during transition period. The fluctuation of subcutaneous adipose tissue and muscles protein are proportional with transition status of the cow. The live weight of the cow changes a lot by the status of the fulfillment of the rumen-reticulum in the moment of the weighting of the cow and weight of fetus and associated during pregnancy. Those inconveniences are not present during the evaluation of BCS in the cow [1] although BCS is a subjective method. BCS can be evaluated easily by visual appraisal and this method is more reliable indicator than live weight [1, 3, 8, 9 and 11]. The comparing of two cows with the same BCS had dramatically difference in the body weight [3, 11]. This body weight difference range from 35 kg to 70 kg [22]. The determining of BCS in cows is based on the evaluation changes on fatty reserves in subcutaneous tissue and also to the changes undergone by muscular tissue located mainly on the surface of the body.BCS of cows is determined by several scoring systems, which are, 4 classes,5 classes, 8 classes, 9 classes and 10 class systems. The advantage of the 1-9 scale is that this scale is in line with the other linear scores. A more accurate is the tabular form [31] presented in Table 1, which also reveals the transformation of 5 to 9 scoring system and vice versa.

1.1 Factors which induced BCS in cows

Various factors determine the BCS in dairy cows. The nutrition and type of the feeding is the most important factor. The experiments performed with the different types of the diets proved that feeding with concentrate type in early lactation does not affect the losses of BCS but dry matter ingested reduced and consequently the BCS of cows decrease [22,12,29,28,7]. The researchers joined in the same conclusion that in this type of the nutrition and physiological status of cows, BCS decreased and the lipolysis and proteolysis was more intense. The decreasing of dry matter ingested and lactation was the intense factor for the negative energetic balance in the dairy cows and reduction of BCS [13, 15, 16, 5,2, 4, 29]. The decreasing of the BCS in cows reflected on the duration of the service periods, the quality of ova and the course of the new pregnancy and the quality of the calves. The fluctuations of the BCS have had high incidence of the difficulty in calving, the mastitis, the uterine infections, the leg problems, the displaced of abomasums, etc. [33].The BCS is for sure a heritable trait. Heritability estimates for BCS range from 0.3 to 0.4. But epigenetic factors as DNA methylation, histone acetylation make up factors that changes spatial conformation of gene and affect mechanisms of expression of genetic information [33].

The objective of the study is to evaluate the BCS of cows by 1-9 system and create opportunities to

Correspondence: Ilir Dova, Faculty of Veterinary Medicine, Agricultural University of Tirana, Albania,; Email: dova_ilir@yahoo.com
(Accepted for publication 20 May 2013)
***ISSN**: 2218-2020, © Agricultural University of Tirana*

introduce this method to assess the level of energetic reserves in cows during puerperal period and to provide high economic returns and to achieve a good health status in cows.

2. Material and Methods

To realize this study we analyzed 10 cows from each of the three farms (Ndroq and Kashar in Tirana and Lushnja).Cows are followed at 4 different physiological states. Evaluation of BCS in cows was determinate with 9 scoring system [19] This system allows for a more accurate evaluation of BCS in cows compared to the other systems (Table 1). This is evaluation is easier to do with 0.5 class interval than 0.25 interval in 5 class system.

These anatomical points in schematic form are shown in Figure 1.To increase the level of probability of the system with 9 classes the lower division that can be done is on the border of 0.25 scale systems. Table 1 shows some of the evaluation points system of BCS on their characteristic during the survey on cows in two views, caudal and lateral sides. All survey results are organized in tables with the specific assessment. On this basis, we made the evaluation of BCS in cows from the survey.

Table 1: BCS in Canadian and American system and interconverting

Systems of BCS		Description of status
Canadian (5 classes)	**American (9 classes)**	**Description of status**
Weak		
1	**1**	Emaciated; starving and weak; the entire body is extremely thin, and all skeletal structures are prominently visible. No muscle tissue is evident and no external fat is present. All the skeletal structures are visible and very sharp to the touch. The hair coat appears to be very dull. Survival during stress is doubtful.
1.5	**2**	Very thin, somewhat emaciated; The vertebrae along the top line are prominent. The hooks and tail head are visually less prominent. There is no fat around the hip bone and pin bone and tail head.
2	**3**	The animal is thin. The vertebrae along the top line are prominent. Muscle tissue is evident, but not abundant. Individual vertebrae can be felt, but are not as sharp. The short ribs can be identified individually when touched, but they feel sharp rather than very sharp. Individual ribs can be identified visually. There is some tissue cover around the hook and tail head.
Optimal		
2.5	**4**	Individual ribs noticeable but overall fat cover is lacking; increased musculature through shoulders and hindquarters; hips and short ribs feel slightly round versus sharp.
3	**5**	Increased fat cover over ribs, and ribcage is only slightly visible. Muscle tissue is nearing the maximum. Generally only the 12 and 13 ribs are individually distinguishable. There are obvious fat deposits behind the front shoulder. Areas on each side of the tail head are fairly well filled but not rounded.
3.5	**6**	Back, ribs, and tail head slightly rounded and feel spongy when palpated.
Fat		
4	**7**	Moderately fat the bone structure is no longer noticeable. The skeletal structure is difficult to identify. Individual short ribs cannot be felt even with firm pressure. Folds of fat are beginning to develop over the ribs and thurl area of the animal. Fat cover around the tail head is evident on both sides as slight "rounds" that are soft to the touch.
4.5	**8**	Fat; very fleshy, squared appearance due to excess fat over back, tail head, and hindquarters. Individual short ribs cannot be felt even with firm pressure. Mobility may begin to be restricted.
5	**9**	Very fat or obese - The animal has a "blocky" appearance. The bone structure is not noticeable. The back bone has a flat appearance and cannot be felt even with pressure. Folds of fat are apparent over the ribs, thurl and thighs. The hip bones and tail head to pin area on both sides are completely buried in fat. The animal's mobility is impaired by the large amounts of fat.

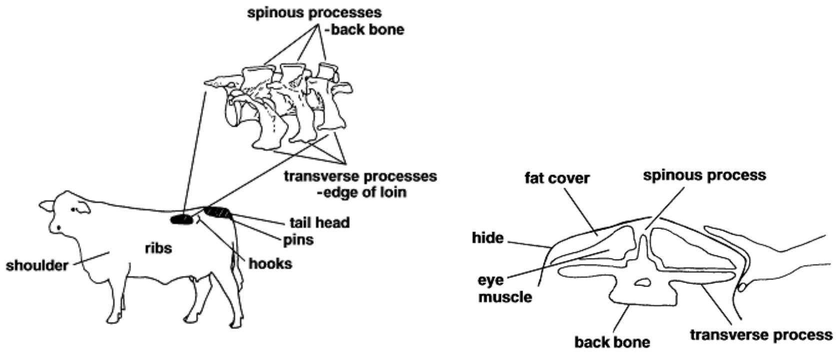

Figure 1: Anatomical positions were BCS is performed. Source: Government of Alberta:Alberta.ca, Agriculture and Rural Development

3. Results and Discussion

Based on palpation and visual evaluation is realized the classification of cows that are included in the study, indifferent physiological conditions. In Figures 2 and figure 3 are presented different classes of BCS on cows that are objective of our study. In order to reduce the number of figures are presented cows with different classes of BCS, regardless the economy or the physiological condition of the cows.

Figure 2: One month after calving BCS 3.8 in Ndroqi farm.

Figure 3: BCS in different physiological state (Two month after calving BCS 3.5 in Ndroqi farm)

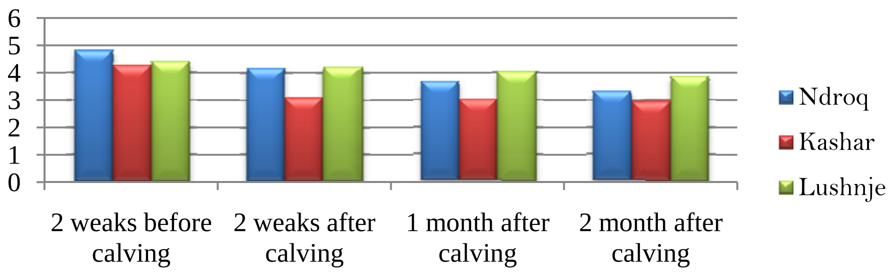

Figure 4: BSC of cows according to different physiological stages (different farms)

All farms included in study shows that the BCS level is lower than the ideal one (Figure 4).This proves that all the farms involved in the study have a level of feeding which is not optimal.

Dynamics of BCS depends on the physiological state before calving period. In the period up to 2 months after calving is observed a gradual reduction of BCS in dairy cows. Increase of BCS starts 4 month after calving. This dynamic is consistent with the data of different authors [3,20,25] during the transition from one physiological state to another. The result of study conducted in three farms for the period 2 week before until 2 months after calving, are given in Graf 1. The BCS in Ndroqi farm is higher in the period before calving than other farms. In Lushnja and Kashari farms it's observed a similar lower dynamic of BCS. The reduction of BCS between the Ndroqi's and Kashari's farm in the period before calving is 0.55 scales but in Ndroqi with Lushnja farm is 0.41 scales.

From the comparison data, in the period of 2 weeks after calving is demonstrated that between Ndroqi's and Kashari's farm the BCS is reduced 1:09 scale and in Lushnja is reduce with 0.05 scale system. In other data's in the period of one month after calving, it is demonstrated that reduction of BCS on Ndroqi's and Kashari's farm the average is 0.67 scale, followed by Ndroqi and Lushnja's farm with 0.35 scale. Two months after calving it is demonstrated a difference of 0.4 scales between Ndroqi's and Kashari's farm and 0.42 scales between Ndroqi's and Lushnja's farm. The reduction of BCS from one physiological state to another is determined from different individual genetic features on farms, reducing the ability of cows feeding as well as defects in the diet of cows. Non-uniform character of the reduction in various farms is determined as well as by other authors [18,21] but the real discovery of this disinformation causality remains to be clarified

Table 2. The implication change within the same physiological state of cows

Physiological status	*Ndroq: Kashar*	*Ndroq: Lushnjë*	*Kashar: Lushnjë*
2 weeks before calving	4.3[a]	2.3[c]	0.74
2 weeks after calving	4.26[a]	4.22[a]	0.33
1 month after calving	4.27[a]	2.36[c]	5.34[a]
2 month after calving	2.19[c]	2.83[c]	5.0[a]

Reduce of BCS on the cows taken for the study have statistical validity depending on the physiological state and farm (Table 2).

Data in Table 2 show that after calving period the differences between cows of Kashar: Ndroqi's farm and Ndroqi: Lushnja's farm have statistically verified changes, respectively ($P< 0.001$ and $P< 0.05$) between Kashar: Lushnja's farms the changes are statistically unproved ($P >0.05$). Two weeks after calving the differences between Kashar: Ndroqi's farms and Lushnja: Kashari's farms to are statistically verified ($P< 0.001$), while between Kashar: Ndroqi's farm are not statistically verified ($P >0.05$). In the period of one month after calving statistical changes have determined differences in all cases but the intensity of these changes is different. In this way, comparing thechange probability between Ndroqi's and Kashari's farm and Lushnja with Kashari's farm is higher ($P<0.001$) and also between Lushnja and Ndroqi's farm the probability is lower ($P< 0.05$). We notice, that in the period of two months after calving, the difference between groups is statistically verified but in the first two couples this difference is lower ($P> 0.05$), while in the third couple the difference is considerable ($P> 0.001$).

Table 3. The average values according to economies (M ±m) n=10

Farm	*2 weeks before calving*	*2 weeks after calving*	*1month after calving*	*2 months after calving*
Ndroq	4.83±0.08	4.19±0.09	3.69±0.07	3.35±0.09
Kashar	4.28±0.1	3.1±0.24	3.02±0.14	2.95±0.16
Lushnjë	4.42±0.16	4.24±0.12	4.04±0.13	3.87±0.16

The average level of BCS in Ndroqi's farm is 4.83 degrees. On the other side, the average level changes in Kashari's farm is lower, up to 4.28 degrees, while in Lushnja's farm the average BCS is 4.42 degrees. Two weeks after calving we notice a decline of the BCS level. Two weeks before calving the BCS on Ndroqi's farm presents an optimal energetic level. BCS decreases 0.64 scale 2 weeks after calving. Meanwhile the decreasing of BCS one month after calving is almost 0.47 scale and two months after it achieves the value of 3.35 classes or 0.34 scale compared to its previous period.

These data are lower than the ideal BCS in cows. This situation is closely related to the structure of cow's feeding, which does not change regardless of the transition from one physiological state to another as well as by the reduction of feed consumption. The BCS in the two other farms is lower than Ndroqi's farm. The reduction dynamics in Kashari's farm is more emphasized in the period of two weeks after calving. It decreases 1.18 scales. One month after calving the reduction is 0.08 scale and two months after it decreases up to 0.07 scales. The reduction dynamics in Lushnja's farm is less emphasized. Two weeks after calving it decreases 0.18 scales, one month after calving it decreases 0.2 scale and two months after calving it decreases up to 0.17 scale compared to its respective previous periods.

Table 4. The probability of change of BCS in cows in three economies, in different physiological state

Farm	*2 weeks before calving: 2 weeks after calving*	*2 weeks after calving: 1 month after calving*	*1 month after calving: 2 months after calving*
Ndroq	2.37[c]	4.38[a]	2.98[c]
Kashar	4.26[a]	0.3[d]	5.02[a]
Lushnjë	0.9[d]	1.13[d]	0.85[d]

n = 10, a=P<0.001; b=P<0.01; c=P<0.05; d=P>0.05

Table 4, shows us that in Ndroq's farm changes are present in all physiological conditions. They have a higher probability to change in a period of 2 weeks after calving by one month after (P<0.001) and a lower probability in the other physiological conditions (P<0.05). Meanwhile, in Kashari's farm, changes are more sensitive in the period of 2 weeks before calving and two weeks after, as well as in the period of one month after and two months after calving (P<0.001). Anyway there are not statistically verified changes in the 2 weeks after and one month after calving (P >0.05). We notice another fact in Lushnja's farm. The difference exists but it is not confirmed statistically (P >0.05). Other authors as [18, 21] have noticed non-uniform dynamics of decreasing BCS. The reduction of BCS of cows after calving is related to the fact that about 30% of dry matter of milk produced in their bodies comes from the mobilization of tissue reserves in an ideal BCS [10,11].We can say this, because the food needs can't be fulfill with the diet already used [24,34,6]. Another issue that affects the state of BCS is the dry matter obtained by feed, which is significantly reduced, especially in the first period after calving, [17, and 21]. During lactation, the increase of the dry matter obtained from feed portion is smaller than the increase of milk production, this dynamic last up to the 4th month after calving [25, 24]. As a result, also the diameter of adipose tissues cells is reduced during the phases of physiological status as it is observed in our research [26, 18]. So, this is the main reason why the BCS is reduced [32, 25, and24]. The increasing of lipolysis originated from the reduction of insulin biosynthesis [34, 24] as well as the decreasing of insulin/glucagon ration in blood [35].

4. Conclusions

Analysis of the results obtained from different farms revealed that BCS can be a useful guide in puerperal period. BCS of cows during puerperal period reflects the nutritional status of heard. Cows with optimal energy balance are able to perform positive capacity in the heard.BCS of cows on the farms included in the study presents the average value and boundary value about (4 scale).BCS of cows' decrease gradually in three periods after calving compared with before calving period.

5. References

1. Andrew SM, Waldo DR, Erdman RA: **Direct analysis of body composition of dairy cows at the three physiological stages**. *J DairySci.*, 1994, 77: 3022-3033.
2. Beam SW, Buttler WR: **Effects of energy balance on follicular and firs ovulation in postpartum dairy cows**. *Reprod Fertil.*,1999, 54: 411-424.
3. Bewley JM, Schuts MM: **Body condition scoring for dairy cattle**. In: American Registry of Professional Animals Scientists. Dairy Cows. *Dairy Sci.*,2008, 1989; 72: 68-78
4. Buckley F, Sullivan K, Mee JF, Evans RD, Dillon P: **Relationships among milk yield, body condition, cow weight, and reproduction in spring-calved Holstein-Friesians**. *J. Dairy Sci.*, 2003, 86:2308-2319.
5. Butler WR, Smith RD: **Interrelationships between energy balance and postpartum**

reproductive function in dairy cattle. *J. Dairy Sci.*,1989, 72:767-783.

6. Chillard Y: **Metabolic adaptions and nutrient partitioning in the lacting animal**. In: Biology of Lactation 1999, 530-552.
7. Delaby L, Faverdin P, Michel G, Disenhaus C, Peyraud JL: **Effect of different feeding strategies on lactation performance of Holstein and Normande dairy cows.** *Animal*. 2009, 3:891-905.
8. Edmonson AJ, Lean IJ, Weaver LD, Farver T , Webster G: **A body condition scoring for Holstein dairy cows.** *J Dairy Sci*., 1989, 72: 68-78.
9. Enevodsen C., Kristensen T: **Estimation of body weight from body size measurement and body condition scores in dairy cows.** *J Dairy Sci*., 1997, 80:1988-1995.
10. Ferguson JD, Chalupa W: **Impact of protein nutrition on reproduction in dairy cows.** J *Dairy Sci*., 1989, 72: 746-766.
11. Ferguson, JD, Galligan DT, Thomsen N: **Principal descriptors of body condition score in Holstein cows**. *J Dairy Sci*., 1994, 77 (9):2695-2703.
12. Friggens NC, Badsberg JH. **The effect of breed and parity on lactation curves of body condition estimated using a non-linear function.** *Animal*. 2007, 1:565-574.
13. Garnsworthy PC, Jones GP: **The influence of body condition at calving and dietary protein on voluntary food intake and performance in dairy cows**. *Anim Prod.*, 1987, 44:347-353.
14. Garnsworthy PC: **Body condition score in dairy cows.** *Targets for production and fertility in recentavances in animal nutrition.* 2006, 61-86.
15. Grainger C, McGowan AA: **The significance of precalving nutrition of the dairy cow.** In: Macmillan KL, ÂTaufa VK editor. Proc. Conf. Dairy Production from Pasture**.** Hamilton, New Zealand: Clark and Matheson Ltd.1982,p. 134-171
16. Gransworthy PC, Toops 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; 113-119.
17. Grummer RR, MashekDG, Hayirli A: **Dry matter intake and energy balance in the transition period**. *Vet Clin North Am Food Anim.*, 2004, 20(3):25.
18. Huzzey JM, Veira DM, Weary DM, Von Keyserlingk: **Prepartum behavior and dry matter intake identify dairy cows at risk for metritis.** *J Dairy Sci*., 2007, 90(7):3220-3233.
19. Jack CW:**Body Condition Scoring of Beef and Dairy Animals.** University of Missuri, 2007.
20. Lorin AV: **Controlling energy intake in the prepartum periode to improve transition cow's health**. Thesis for the master science degree. 2011.
21. Lowman BG, Scott NA, Somerville SH: **Condition Scoring of Cattle**," East of Scotland College of Agriculture 1976 Bulletin 6.
22. McCarthy S, Berry DP, Dillon P, Rath M, Horan B: **Influence of Holstein-Friesian strain and feed system on body weight and body condition score lactation profiles.** *J Dairy Sci., 2007:*90:1859-1869.
23. McDonald P, Edwards RA, Greenhalgh JFD, Morgan CA: **Animal Nutrition.** 1995.
24. McNamara JP: **Regulation of adipose tissues metabolism in support of lactation.** *J Dairy Sci.*, 1991, 74(2): 706-719.
25. Meikle A, Kulscar M, Chilliard Y, Febel H, Delavaud C, Cavestany D, Chilibroste P: **Effects of parity and body condition at parturition on endocrine and reproductive parameters of the cow**. *Reproduction*, 2004, 127:727-737.
26. Moro-Mendez, JC: **Phenotypic study of body condition score in Canadian dairy cattle**. *J Anim Sci*., 2008, 88: 213-224.
27. National Research Council's publication ***Nutrient Requirements of Dairy Cattle*** *2001*.
28. Pedernera M, Garca SC, Horagadoga A, Barchia I, Fulkerson WJ: **Energy balance and reproduction on dairy cows fed to achieve low or high milk production on a pasture-based system.** *J Dairy Sci., 2008*, 91:3896-3907.
29. Roche JR: **Milk production responses to pre- and post-calving dry matter intake in grazing dairy cows.** *Livest Sci., 2007*, 110:12-24.
30. Roche JR, Dillon PG, Stockdale CR, Baumgard LH,Van Baale MJ: **Relationships among international body condition scoring systems.** *J Dairy Sci.*, 2004,87: 3076-3079.
31. Roche JR, Berry DP, Kolver ES: **Holstein-Friesian strain and feed effects on milk production, body weight, and body condition score profiles in grazing dairy cows.** *J Dairy Sci*., 2006, 89: 3532-3543.
32. Santos JEP: **Dietary ingredients and nutritional management impact fertility in dairy cattle**.In

Proc. 36th Pacific Northwest Animal Nutrition Conference, 2001, 182-219.

33. Sinclair KD, Lea RG, Rees WD, Young LE: **The developmental origins of health and disease: current theories and epigenetic mechanisms.** Reproduction in Domesticated Ruminants**.** UK: Nottingham University Press; 2007, pp 425-433.

34. Vernon RG: **Lipid metabolism during lactation: a review of adipose tissues-liver interaction and the development of fatty liver.** *J Dairy Res.*, 2005, 72(4):460-46.

35. Xoxa A , Mane B: **Biokimia,** 2005.