



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2019; 7(2): 554-560

© 2019 JEZS

Received: 14-01-2019

Accepted: 18-02-2019

CP Ghosh

Department of LFC, F/VAS,
WBUAFS, Kolkata, West
Bengal, India

S Datta

Department of AGB, F/VAS,
WBUAFS, Kolkata, West
Bengal, India

D Mandal

Department of Veterinary
Gynaecology and Obstetrics,
F/VAS, WBUAFS, Kolkata,
West Bengal, India

AK Das

Department of AGB, F/VAS,
WBUAFS, Kolkata, West
Bengal, India

DC Roy

Department of LFC, F/VAS,
WBUAFS, Kolkata, West
Bengal, Kolkata, West Bengal,
India

A Roy

SMS (Animal Science),
Murshidabad KVK, WBUAFS,
Kolkata, West Bengal, India

NK Tudu

Department of Veterinary
Anatomy and Histology, F/VAS,
WBUAFS, Kolkata, West
Bengal, India

Correspondence

CP Ghosh

Department of LFC, F/VAS,
WBUAFS, Kolkata, West
Bengal, India

Body condition scoring in goat: Impact and significance

CP Ghosh, S Datta, D Mandal, AK Das, DC Roy, A Roy and NK Tudu

Abstract

Body condition is a term used to signify the body reserves present in an individual animal. An animal's body condition indicates the amount of lipid (fat) and protein (muscle) reserves that are available for maintenance, reproduction and production. Body Condition Scoring is an important tool for livestock managers or producers to optimize the production (meat and milk), feeding program, reproduction and welfare of the animals. Scoring is based on determining the amount of muscle and fat over and around the vertebrae. Scoring is performed in goats using a BCS ranging from 1.0 to 5.0, with 0.5 increments. It is helpful to detect changes and sudden losses in condition which are difficult to observe from the external appearance of animal. BCS is used for evaluating the current and past feeding program, judging the health status of individual animals. BCS is a simple but useful procedure, which can help producers make management decisions regarding the quality and quantity of feed needed to optimize production and reproduction thus can play an important role in goat marketing.

Keywords: Goat, body condition, production, feeding, management

Introduction

Indian livestock population has 26% share of goats ^[11] which contribute an estimated 70 to 80% of Indian livestock product sales. Traditionally goat owned by poor or under privileged families and it impacts on their livelihoods and financial security ^[9]. In the present scenario of changing agro-climatic conditions, this small ruminant farm animal has tremendous potential to be projected as the "Future Animal" for rural and urban prosperity. The backyard goat and sheep rearing is steadily turning as the fast growing livestock industry in the country. Small ruminant husbandry in India is essentially a "Rural Bank" of millions of small holders who rear animals on "Crop Residues" and "Common grazing land". The small ruminant produces milk, meat, fiber, skin, etc. The small and marginal farmers rear this with little capital, resource and formal training. More often goats are reared for production of meat, but they also serve as ready source for milk to meet the family requirement. The meat production in the country as per 2015-16 data was 7 million tons with a per capita availability of 4.94 kg. Total Goat Meat production in 2015-16 was 942.91 thousand tons. Due to their higher fecundity and better productivity, goat assured income to the rural population with low input cost in various agro-climatic conditions of our country. They generally follow the extensive management system, primarily with poor natural vegetation and crop residues, without any supplementation, lack of routine preventive health care (vaccination), heavy parasitic infestation along with infected with various systemic diseases.

Body Condition Score (BCS) is subjected to quantify the degree of fatness or condition of the live animal ^[17]. BCS is the best simple indicator of body fat reserves which can be used by the animal itself in the periods of high energy demands, various stresses or under nutrition condition, and thus widely accepted indicator of post nutritional status ^[2]. The technique can be used for various species of animal like cattle, sheep and goat as well. BCS is used for evaluating the adequacy of previous feed supply, determining the future feed requirements, assessing the health status of individual animals, establishing the condition of animals during routine animal management and welfare inspections ^[12] and in meat production systems ^[8].

Advantage of BCS over others

In farm, body weight or heart girth usually monitored to quantify status of animal, but these techniques have a number of disadvantages. First, weight scales are cumbersome,

expensive and difficult to transport. Second, weight per se does not reflect an animal's condition; animal with a large frame may have a higher body weight when at a low level of body reserves than other animal with a small frame, but abundant reserves; animal must therefore individually identified to record seasonal weight change. Third, large variations in live weight may occur as a result of changes of gut and bladder fill, pregnancy and parturition. Moreover, weight changes reflect tissue hydration rather than significant alterations of protein or fat content. Measuring the heart girth requires that individual animals be restrained and results vary according to posture, positioning and tension of the tape, coat thickness and gut fill.

BCS provides a measure of fat cover on the goat irrespective of body size. BCS accomplished by assigning a score to the amount of fat observed at several skeletal checkpoints on the goat. These checkpoints include spinous processes, transverse processes, hooks, pins, and tail head. Ultrasonic assessment of subcutaneous fat indicates that BCS correspond closely to the actual measurement of the subcutaneous fat, indicating the accurate measurement of fat cover can be made by simply evaluating fat cover variation on the check points of animal.

The body weight of the goat generally has two components, the basic skeletal size and the degree of fatness (body condition) of the animal. Due to the variation in skeletal size between does, body weight alone cannot indicate the degree of fatness. BCS is thus an estimation of muscle and fat development of an animal and is correlated with the direct measurement of back fat depth or the proportion of fat in the animal body – providing a better estimate than body weight alone [18].

The one unit of change in BCS equals around 5 kilograms of change in the live weight [13]. There is a high correlation between live weight and BCS and related that one unit of increase in BCS leads to 5.1 kilograms of change in the live weight [19].

Precautions during body condition scoring

Always use the same hand to score goats. The ultimate beneficiary of BCS in individual farm is producer.

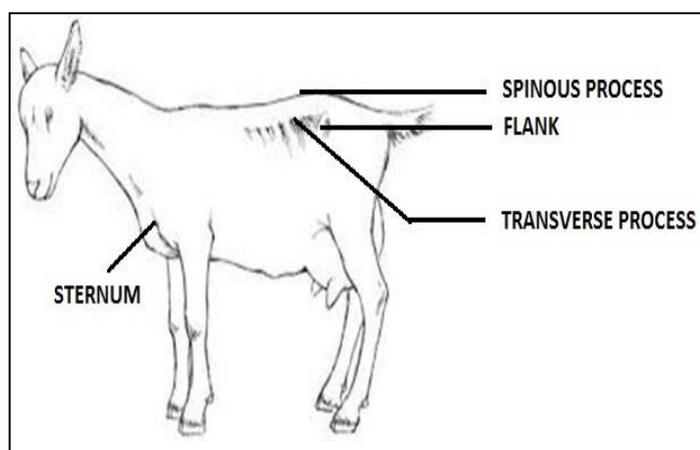


Fig 1: Skeletal Check Points for BCS in goats

Unfortunately, producer is often the poorest choice of individuals to perform scoring. The producer biases while scoring the individual goats. So, a third party such as nutritionist or veterinarian should do so scoring. It may vary marginally from person to person on the same farm. As long as the same individual evaluates the farm each time, a useful set of scores will be produced. Anyone can learn to score his or her herd's body condition. All it takes is a little practice and time. In many cases, it may be better to have an outsider score the herd to obtain an objective score. Perhaps a extension supervisor, field man, veterinarian or neighboring producer would be suited to objectively score the herd. It might even be a good idea for goat producers to score each other's herd..

Methods of Scoring

Scoring is performed in goats using a BCS ranging from 1.0 to 5.0, with 0.5 increments. It is important to note that BCS cannot be assigned by simply looking at an animal. Instead, the animal must be touched and felt [5]. With practice, evaluating the BCS of an animal will only take about 10-15 seconds. By adding BCS as a regular part of your management program, you can more effectively monitor your feeding and herd health program for a healthy and productive herd [24]. Scoring is done by using the hand to feel for the fullness of muscling and fat cover over and around the vertebrae in the loin region. The following skeletal check points were observed by palpation. Lumbar vertebrae have a vertical protrusion (spinous process) and two horizontal protrusions (transverse process). Both are very important for determining BCS.

Skeletal check points

1. The spinous processes in the centre of the goats's back behind the last rib and in front of its hip bone.
2. The tips of the transverse processes.
3. The fullness of muscle and fat cover between spinous and transverse processes.
4. Hollow in the flanks below the loin (fat cover on the rib cage, on the ribs and intercostals (between ribs) spaces).
5. Fat covering on the sternum.

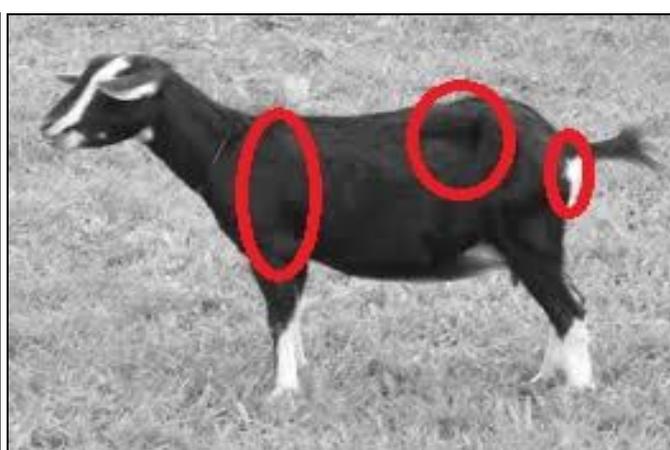


Fig 2: Points of Consideration

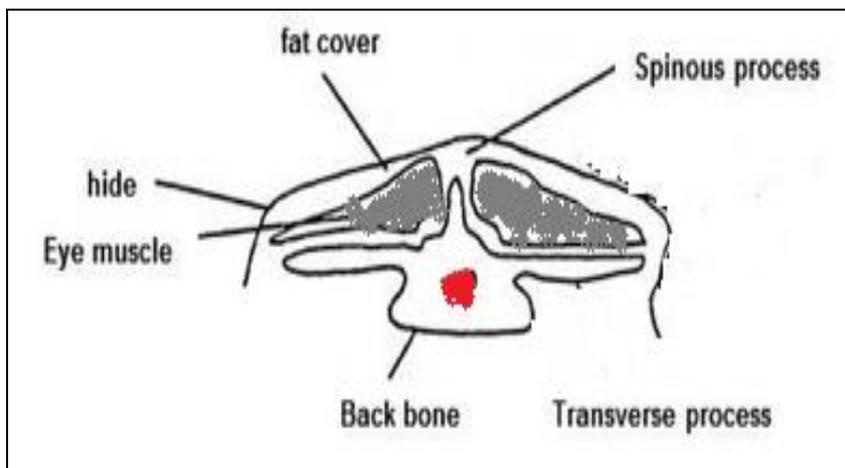
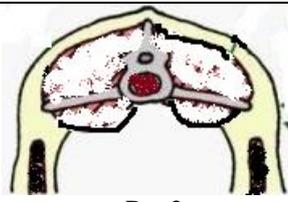
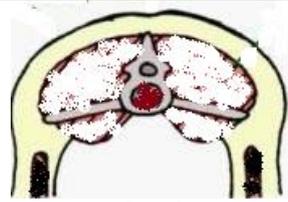
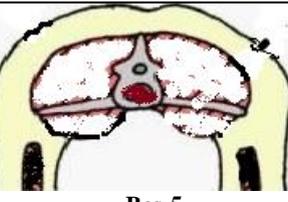


Fig 3: Area to Be Checked For Fat Cover

Table 1: Assigning BCS

BCS	Physical Appearance	Skeletal Check Points	Diagram (Cross Section)
1	Emaciated And Debilated Animal, The Back Portion Is Highly Visible, The Flank Is Hollow. Ribs Are Clearly Visible. There Is No Fat Cover And Fingers Easily Penetrate Into Intercostals Spaces.	The Spinous Process Is Very Prominent, And Giving A Boney Appearance. Very Little Muscle And No Fat In Between The Skin And Bone. A Prominent Depression In The From The Spinous To Transverse Process. Half Of The Transverse Process Clearly Visible. The Cartilage And Joints Joining Ribs And Sternum Are Easily Felt.	 Bcs-1
2	Slightly Bones Are Distinct; The Backbone Is Moderately Visible With A Prominent Ridge. Ribs Are Felt. Little Bit Fat Cover On Ribs. Intercostals Spaces Are Smooth But Can Still Be Penetrated.	Spinous Processes Giving Appearance Of Prominent Ridge. One Third Of The Transverse Processes Are Visible And It Is Possible To Pass Fingers Under With Pressure. The Muscle Area Is Of Moderate Depth And Little Bit Fat Covering Between The Two Processes. Flank Is Hollow.	 Bcs-2
3	The Backbone Is Not So Prominent. Ribs Are Not Clearly Visible; Covered With Thin Layer Of Fat. After Applying Pressure Intercostals Spaces Can Be Felt.	Spinous And Transverse Processes Are Smooth And Rounded Appearance. The Muscle Area Is Full With Moderate Fat Covering Between Two Processes. Hollow In The Flanks Are Barely Concave.	 Bcs-3
4	The Backbone Cannot Be Seen. Ribs Are Not Seen (Covered With Distinct Thick Layer Of Fat). The Side Of The Animal Is Slightly Round In Appearance.	Spinous Processes Are Flat In Appearance. Transverse Processes Are Not Visible And Need Considerable Pressure To Find The Ends Of The Processes. The Muscle Area Is Full With Thick Fat Covering Between The Processes. Hollow In The Flank Below The Loin Is Not Appreciated.	 Bcs-4
5	The Backbone Is Completely Covered With Fat. Ribs Are Not Visible. Curvature Of Flank Is Not Seen. Excessive Fat Deposition On Pelvic Region And Sternum.	The Thickness Of The Muscle And Fat Is So Great That Demarcations On The Spinous Process Are Completely Lost. There Is Bulging Transition In Between Two Processes. The Thickness Of The Muscle And Fat Is Very Distinct And Difficult To Felt Transverse Process. The Sternal Fat Covers The Sternum, Joining Fat Covering Cartilage And Ribs.	 Bcs-5

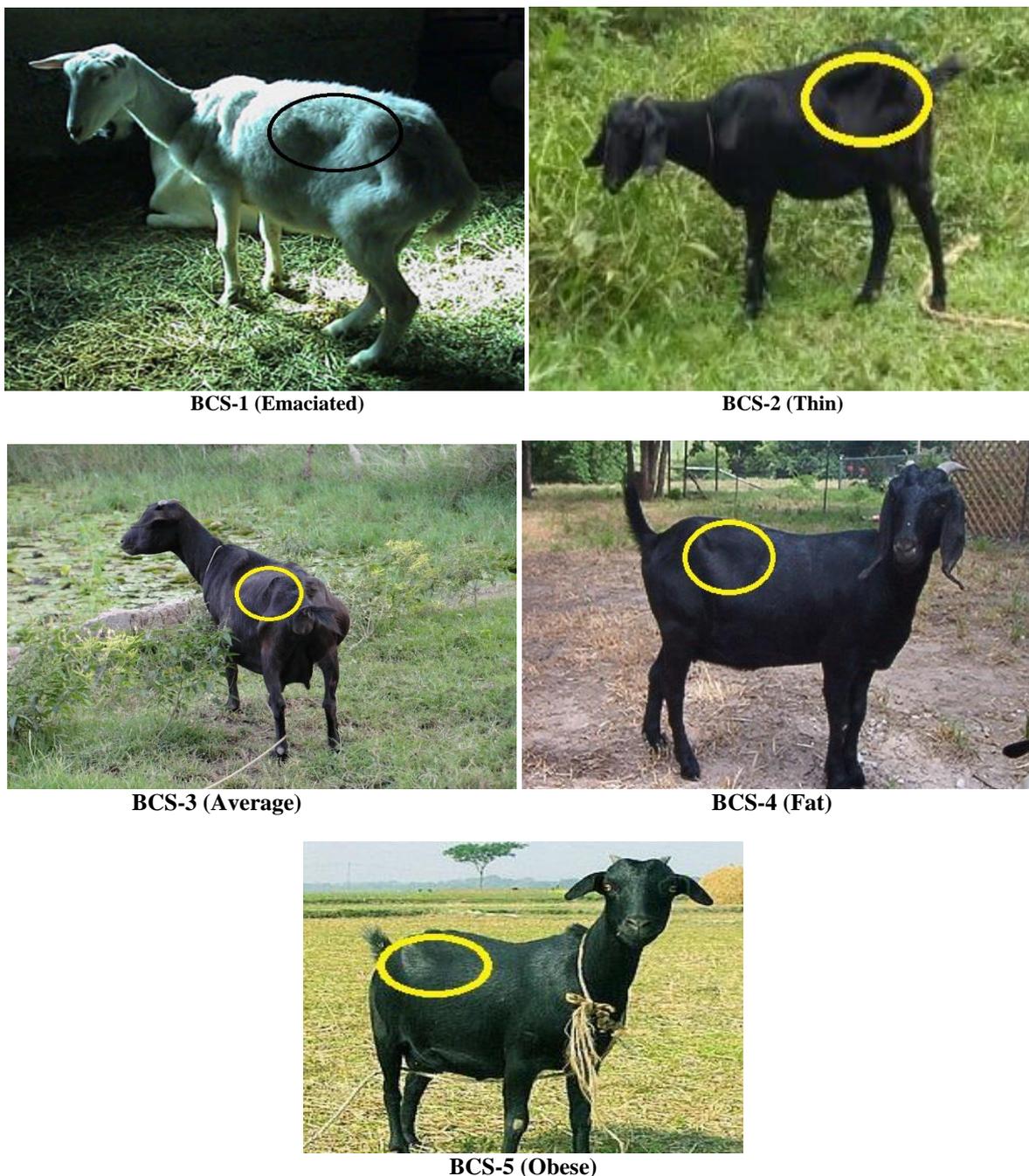


Fig 4: Various Factors Effect Bcs

Management and feeding strategies: The type of feeding systems can be an important factor in managing body condition in a dairy goat. Grouping of doe can be done on the basis of various criteria, like age and/or parity, stage of lactation, somatic cell counts and/or udder health status. Debilitated or low BCS goats can be grouped separately to provide them with adequate extra nutrition in terms of energy and protein with ample access to feeds and foddors. On the other hand fatty doe should have limited access to feed.

Health: Various health factors will directly affect BCS in goats. These include, parasites, wasting disease, viral or bacterial and metabolic diseases. A sound herd health program should be in place in order to adequately address these factors.

Structure: A goat with undesirable structure (particularly deformity in leg, hoof and hip) will be less able to walk to

graze for forage, less able to compete with other animals in the group. These traits will worsen with advancement of age, thereby limiting the productive life of animals with faulty structure. Poor structure and mobility is considered as a precious factor for low BCS.

Age: As the goats become older, they lost their body fats very rapidly. When scoring older does and bucks (<7-8 years or in Gummer/broken mouth stage) care must be taken to allow for the reduction in muscle mass but still be able to evaluate the fat cover to determine if an older animal is maintaining an acceptable BCS.

Milk production and Stage of lactation: Milk production generally peaks six to nine weeks after kidding, and feed intake does not peak until later. Thus does are usually in a state of negative energy balance in early to mid lactation. Therefore, body reserve fat and protein have to be used to

make up for this energy deficit. In this condition, the level of BCS was decreased as well as the milk production to 60 – 80% of the peak and lactation stage influences BCS, serum glucose and milk constituents [3]. So body condition score (BCS) in dry period is important. A positive correlation exists between milk production and body weight. Storage of body fat during the dry period influences milk production positively at the onset of lactation [14]. The association between BCS and milk production is probably through signaling the hypothalamus via leptin hormone which regulates body metabolism. Leptin serves as an intake satiety signal by acting predominantly on regions of the brain involved in regulation of energy metabolism [16].

Doe have lowest BCS during peak lactation and there is negative relationship in between BCS and milk production. High producing doe show low BCS during kidding and peak lactation so feeding should be adjusted accordingly. As the lactation stage progresses, milk production will be lower and BCS will increase gradually. This is desirable for the doe to have body reserves in order to conceive and to carry a number of kids to term. During dry period the BCS should be optimum. They should kid at approximately the same body condition score as at dry-off. At freshening, does should have a relatively higher BCS to compensate early lactation loss. Once pregnant, does should be fed to maintain a body

condition adequate to support the last months of lactation and the gestation period. Does should not be expected to lose body condition during the dry period.

BCS and Buck: Bucks also have cycle of BCS throughout the year. They have exceptionally low BCS during their breeding period due to low feed intake and higher activity. During this period, they will show more activity like fighting with other bucks, chasing does and running abruptly etc. After passing the breeding cycle they rejuvenate their BCS gradually. They need good BCS (>3.0 and proper physical shape and stamina before the start of breeding season. So it is important to supplement extra concentrate along with grazing to prevent abrupt loss of body weight.

Behavioral pattern: Goats are usually reared in flock and they also developed social hierarchy in their herd. Dominant goats always push back inferior for feed, fodder and shelter. So goats having lower rank in social hierarchy usually show low BCS. So one should be careful before introduction of new goat because they show lowest order in group, it is usually advisable to introduce new goat as group not as individual. There should be provision of ample feed and water space along with sufficient feed and fodder.

Table 2: Ideal Range of BCS in Various Physiological States

Type of Goat	Ideal BCS	Recommendation
Breeding buck	3.0-3.5	BCS>4, Poor or Lack of sexual desire. BCS<2.0-2.5 not have sufficient stamina and vigor to breed. They should have 3.0 score before the start of the breeding season.
Pregnant Doe	3.0-3.5	BCS>3.5 leads to pregnancy toxemia (ketosis), retention placenta, fatty liver, abomassal displacement and dystokia. BCS<2.0-2.5 leads to poor kid survivability and milk production.
Kidding	3.0-3.5	To ensure that they have adequate body condition to ensure the birth of viable kids, adequate colostrum production and reserves to support high milk production, particularly in early lactation.
Lactating Doe	2.5-3.0	BCS should not drop below 2.0-2.5, BCS should not drop too quickly during lactation, which leads to anoestrous, un-ovulatory estrous, shorter estrous, repeat breeding and infertility.
Flushing	2.0 or less 3.5-4.0 or more	Will better response to flushing treatments. No need of flushing
Any stage	2.5-4.0	Healthy
Any stage	1.0-1.5-2.0	Management or health problem

Bcs and Reproduction

In order to maintain optimum reproduction animal must have desired BCS. To maintain health, reproductive function and productive capacity, females must have adequate amounts of body reserves, particularly dairy goat. There are several reports suggesting a positive correlation between BCS at mating and reproductive performance [1, 20, 25]. BCS directly affects hypothalamic activity and GnRH secretion, but not pituitary sensitivity to GnRH, and these effects on reproductive performance are also mediated through changes in ovarian hormones or in hypothalamo-pituitary sensitivity to ovarian hormones [15]. Most of workers recommended 3.0-3.5 (5 scale) BCS during breeding period [21, 24].

Bcs and Flushing

When does with poor BCS, they usually have low conception rates, low twinning% and kids with low birth and weaning weights [22, 10]. Goats start loses BCS when quality of pasture nutrient reduced particularly in summer months. Under such condition, protein or energy-based supplementary feeding (flushing), around the time of mating usually improves reproductive performance by increasing the expression of estrus, conception, fecundity and twinning rates of goats [4, 6, 7].

Body condition score is also used to determine whether flushing will be of benefit to breeding does or not. Flushing denotes increasing the level of feed offered to breeding does, mostly energy, starting about one month prior to expected breeding season and the main objective is to increase weight gain, ovulation rate and litter size. Does in extremely good body condition (BCS >3.5) will not tend to respond to flushing. On the other hand, does that are in relatively poor condition (BCS = 2 or lower) as a result of poor feed quality and supply, high worm loads, late kidding of twins or triplets, will respond favorably to flushing by improving their body condition. Goat should be scored two months prior to breeding season. If they attain 4.0 BCS then animal should be given low energy diet. If BCS is below 3.0 then animal should be given energy reach concentrate (500 gm-750 gm, with CP-13-15% and TDN-65-70%) to reach optimum BCS >3.5 during kidding. So both dairy and meat goat breed with optimum BCS and better live weight during breeding season (mating period) will have higher fecundity and litter size. Flushing can be accomplished by moving breeding does to a green nutritious pasture one month prior to the introduction of the bucks. In our country maize/wheat is the grain of choice for flushing; whole cottonseed is another low cost, high

energy and protein supplement. Our objective being to increase the intake and body weight and breeding does should be grouped according to their body condition for better management.

Conclusions

The BCS in each physiological stage of does has significance to the evaluation of herd productivity. Control of the nutritional level of the goat to maintain a desired of body condition, keeps it not very fat or very thin, the reproductive performance of does could be ensured and the feeding cost also could be reduced to obtain great economic benefits. Lack of knowledge about the proper condition in different physiological states and thus corrective actions will cost in terms of reduced fertility, increased various diseases or internal parasite load, decreased milk production, and increased feed cost. Thus, goats need to be maintained with a moderate desired body condition. When overall BCS of a farm/flock reduced drastically this means the farm needs proper managerial actions like deworming, proper nutritional supplement (in terms of energy and protein), vaccination against common prevalent diseases, improvement of pasture and pasture rotation such as rotational grazing. Conversely, when overall body condition starts to increase in the herd, it is a sign that the producer/farmer should reduce additional feeding. Ignoring an animal's body condition and waiting to intervene until goats become either too thin or too fat may result in production and (or) animal losses or decreased profits from overfeeding. So a farm manager should maintain feeding and other management in such a way that herd/flock should maintain a desired BCS.

References

1. Abdel-Mageed I. Body Condition Scoring of Local Ossimi Ewes at Mating and its Impact on Fertility and Prolificacy. *Egyptian Journal of Sheep & Goat Sciences*. 2002; 4(1):37-44.
2. Caldeira RM, Portugal AV. Relationships of body composition and fat partition with Body Condition Score in Serra da Estrela ewes. *Asian-Australian Journal of Animal Sciences*. 2007; 20:1108-1114.
3. Darwesh A Khalil, Merkhani Y Kawa, Butti TS Emad. Impact of lactation stage on body condition and milk quality of black goat. *International Journal of Agriculture and Food Research*. 2003; 2:48-52.
4. De Santiago-Miramontes MA, Rivas-Muñoz R, Muñoz-Gutiérrez M, Malpaux B, Scaramuzzi RJ, Delgado JA. The ovulation rate in anoestrous female goats managed under grazing different dietary energy level intakes on efficiency of estrus synchronization and fertility in Mashona goat does. *Small Ruminant Research*. 2008; 39:283-288.
5. Detweiler GT, Gipson RC, Merkel A Goetsch, Sahl T. Body Condition Score in Goats. In Proc. 23rd Ann. Goat Field Day, Langston University, Langston, OK. 2008, 127-133
6. Fitz-Rodríguez G, De Santiago-Miramontes MA, Scaramuzzi RJ, Malpaux B. Nutritional grazing conditions and exposed to the male effect. *Animal Reproduction Science*. 2009; 116:85-94.
7. Hafez YH, Khalifa EI, El-Shafie MH, Khalek TMMA, Ahmed ME, Shehata EI. Effect of energy flushing pre-mating and during mating season on production and reproduction performance of Zaraibi goats. *Egyptian Journal of Sheep & Goat Sciences*. 2011; 6(1):7-14.
8. John Suiter. Body Condition Scoring of sheep and goats. Department of Agriculture and Food. Farmnote. 1994; 69.
9. Kurup M. Production structure and cost competitiveness of livestock structure in Asia. In: V. Ahuja (Ed). *Livestock and Livelihoods: Challenges and opportunities in Asia in the emerging market environment*. NDDB-Ananad, 2004, 132-152.
10. Luginbuhl JM, Poore M. Nutrition of Meat Goats. Department of Animal Science, North Carolina State University. Raleigh, NC, 1998. Available at: http://www.cals.ncsu.edu/an_sci/extension/animal/meatgoat/MGNutr.htm
11. Livestock census, 19th Livestock census, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Govt. of India, New Delhi, 2012.
12. Maurya VP, Sejian V, Kumar D, Joshi A, Naqvi SMK, Karim SA. Body Condition Scoring system: A simple tool for optimizing productivity in sheep farms. *Technical Bulletin, Central Sheep and Wool Research Institute, Avikanagar, Rajasthan*, 2008.
13. Oregui LM, Vicente M, Garroj S, Bravo MV. The Relationship between Body Condition Score and Body Weight in Latxa Ewes. *Zaragoza. CIHEAMIAMZ*. 1991, 109-112.
14. Park YW, Haenlein GFW. Milk Production, in *Goat Science and Production* (Editor Sandra G. Solaiman) Wiley-Blackwell. A John Wiley & Sons, Inc, Publication USA, 2010.
15. Rhind SM, Mc Millen S, Mc Kelvey WAC, Rodriguez Herrejon FF, Mcneilly AS. Effect of the Body Condition of Ewes on the Secretion of LH and FSH and the Pituitary Response to Gonadotrophin-Releasing Hormone. *Journal of Endocrinology*. 1989; 120(3):497-502.
16. Roche JR, Lee JM, Macdonald KA, Berry DP. Invited review: Body Condition Score and Its Association with Dairy Cow Productivity, Health, and Welfare. *Journal of Dairy Science*. 2009; 92:5769-5801.
17. Russel A. Body condition scoring of sheep. In *Practice*. 1984; 5:91-93.
18. Russel AJF, Doney JM, Gunn RG. Subjective assessment of body fat in live sheep. *Journal of Agricultural Science*. 1969; 72:451-454.
19. Sanson DW, West TR, Tatman WR, Riley ML, Judkins MB, Moss G. Relationship of Body Composition of Mature Ewes with Condition Score and Body Weight. *Journal of Animal Science*. 1993; 71:1112-1116.
20. Sejian A, Maurya VP, Naqvi S, Kumar MK, Joshi A. Effect of Induced Body Condition Score Differences on Physiological Response, Productive and Reproductive Performance of Malpura Ewes Kept in a Hot, Semi-Arid Environment. *Journal of Animal Physiology and Nutrition*. 2010; 94:154-161.
21. Spahr L. Body Condition Scoring in Meat Goats, 2004. <http://bedford.extension.psu.edu/agriculture/goat/Body%20Condition%20Scoring.html>.
22. Urrutia-Morales J, Meza-Herrera CA, Tello-Varela L, Díaz-Gómez MO, Beltrán-López S. Effect of nutritional supplementation upon pregnancy rates of goats under semiarid rangelands and exposed to the male effect. *Tropical Animal Health and Production*. 2012; 44:1473-1477.

23. Villaquirán M, Gipson R, Merkel R, Goetsch A, Sahl, T. Body Condition Scores in Goats. Langston University, Agriculture Research and Cooperative Extension. Langston, OK, 2012.
24. Villaquiran MT, Gipson RC, Merkel A, Goetsch, Sahl, T. Body Condition Scoring for Improved Management. In Proc. 20th Ann. Goat Field Day, Langston University, Langston, OK. 2005, 111-117.
25. Yilmaz M, Altin T, Karaca O, Cemal I, Bardakcioglu HE, Yilmaz O *et al.* Effect of Body Condition Score at Mating on The Reproductive Performance of Kivircik Sheep Under an Extensive Production System. *Tropical Animal Health and Production.* 2011; 43:1555-1560.