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**Mini Review Article**

# An overview of condition scoring as a management tool in goats

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## Abstract

**Goat contributes a crucial role to the Indian agricultural economy. Goat husbandry frequently employs harsh management techniques, such as poor natural vegetation and crop residues, a lack of nutrients, a lack of normal preventative health care (vaccination), significant parasitic infestation, and a variety of systemic illnesses. The scoring is based on the amount of fat deposition on key body regions in goats. It's usually done in 0.5 increments on a 1 to 5 scale. It depends upon visual observations and palpation on the vertebral column, transverse process, tail head region and ribs, and assigning numerical values to each point based on the thickness of fat deposited on these points. Under conditioned flock tend to suffer from poor milk yield and reproduction efficiency, whereas over condition leads to kidding difficulties and disorders of metabolism. Condition scoring is critical since it provides a direct assessment of their general health, output and reproduction. Scoring at important times allows assessing the flock's nutritional state and provides the farmer with helpful feeding recommendations. BCS is a crucial tool for farm managers to improve production efficiency, feeding program, health, marketing, welfare and profits from livestock.**

**Key words:** BCS, Goat, Nutrition, Production, Reproduction

## Highlights

- The quantity of fat deposition on key body regions in goats determines the BCS.
- Condition scoring provides a direct assessment of general health, output and reproduction.
- BCS is a tool for improving livestock productivity, animal health, welfare and profits.
- The BCS has been discovered to have a significant impact on the birth weight of kids.
- For a farm or in a range/pasture system, it's vital to develop a BCS-based feeding system.

## Introduction

Small ruminants, particularly goats, contribute significantly to farmers' economies by providing meat, milk, dung, wool and other fibres. Goats are extremely tolerant of hot weather and can adapt to a wide range of agro-climatic conditions. Meat is the prime component of goat output, accounting for 13.35 percent of total annual meat production in India in 2019 (20$^{th}$ Livestock census). India has a total goat population of 148.88 million, with goats accounting for 27.79 percent of the livestock population (20$^{th}$ Animal Census), contributing 70 to 80 percent of Indian livestock product sales. Small ruminant rearing in India is effectively a "Rural Bank" of millions of small-scale farmers raising animals on "Crop Residues" and "Common Grazing Land". Sheep and goats produce milk, meat, fibre, skin, etc. With limited resources, capital, and traditional expertise, small and marginal farmers raise this. Goats are often used for meat production and provide a reliable source of milk for the household (Ghosh *et al*., 2019).

The extent to which fat is retained or muscle mass is lowered reflects the status of nutrition to which an animal has been exposed over a fair period of time. This can be visually

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inspected and reported as a condition score (Prasad *et al*., 2006). Despite the fact that BCS is a subjective assessment, it is feasible to achieve a high level of repeatability and reproducibility between employees and observations across time (Croxton and Stolard, 1976). It is possible to score a large number of goats at once without having to handle them or use a weighing scale.

In India, lack of feed, water, and harsh weather circumstances result in a low BCS, which limits goat production. Thus, it is necessary to assess goat fitness using the BCS system and advise farmers on how to maintain the BCS for optimum goat flock productivity.

## Importance of scoring goat

The scoring is a good predictor of fatness and has proven to be highly useful in evaluating correlations between body conditions and certain production characteristics (Frutos *et al*., 1997). Goat scoring is a method for determining a goat's nutritional status or the level of body fat accumulation. It's a crucial metric for assessing herd productivity, testing and speculating on feeding levels. The BCS at every physiological phase of a doe is important in determining herd productivity. It is a set of basic but effective techniques that can assist producers in making management decisions about the nutritive quality and amount of feed required to achieve optimal performance. Koyuncu and Altincekic (2013) claimed that it could also help with goat marketing. It is a predictor of milk production features in goats and can be utilized as a milk production and quality diagnostic (Susilorini *et al*., 2017). The BCS has been used to regulate flock nutrition, nurture lambs and kids for sale, and dispatch lambs and kids. BCS may provide a more solid foundation for understanding the goat's metabolic status, allowing diets to be modified and metabolic diseases to be avoided; all while increasing output (Moeini *et al*., 2014; Ockert, 2015).

## Body condition scoring techniques

Goats are scored using a BCS scale ranging from 1.0 to 5.0 with 0.5 increments (Villaquiran *et al*., 2005). For determining fat cover, this approach analyses muscle and fat over the skeleton, as well as a hollow in the flanks below the loin. The number of '1' indicates emaciated (poor) health, whereas a score of '5' indicates obesity (fatty) health. It's worth noting that BCS can't be determined merely by staring an animal. Over and around the vertebrae in the loin region, we should touch and score the fullness of muscling and fat cover. BCS assignment requires palpation of the following bone check sites: spinous process, transverse process, hooks, pins, tailhead, and rib region. BCS for goats is an effective management tool that may be learned with experience and good observation skills, evaluating each doe by sight and touch. Preferably nutritionists or veterinarians should do the scoring, although it may change from individual to individual. For consistent flock evaluations, a single trained individual should score the animals over successive periods (Prasad *et al*., 2006).

## Assigning score

**Descriptive features of doe with BCS 2.00 (Thin):** Visual aspect of the goat: Slightly raw-boned, the backbone is still visible with a continuous ridge. Some ribs can be seen, and there is a little amount of fat cover. The ribs can still be felt. Although the intercostal gaps are smooth, they can nevertheless be pierced. The lumbar vertebrae's spinous process is visible and may still be grabbed between the hand and forefinger; however, there is a muscular mass between the skin and bone. The transition from the spinous to the transverse process has a noticeable dip. The transverse process can be grasped by the hand; however, the outline of the transverse process is difficult to see. The transverse process is evident for about one-third to half of its length. The thumb and fingers can still grab and pull sternal fat, despite being larger and thicker. The fat layer can still be moved from side to side somewhat. Joints are less evident.

Fig. 1. BCS 2.00 (Thin)

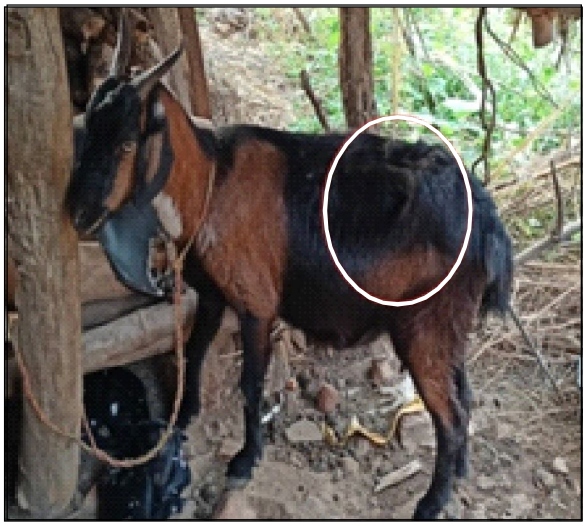

Fig. 2. BCS 3.00 (Good)

**Descriptive features of doe with BCS 3.00 (Good):** Visual aspect of the goat: The backbone is not clear. Ribs are barely discernible; an even layer of fat covers them. Intercostal spaces are felt using pressure. Because the tissue layer surrounding the vertebrae is thick, the spinous process of the lumbar vertebrae is difficult to grasp. A tiny hollow can be felt while sliding a finger across the spinous process. The transition from the spinous to the transverse process has a gentle slope. The transverse process of the lumbar vertebrae can be seen as a faint outline. The transverse process is only visible for about a fourth of its length. The sternal fat is thick and broad. It can still be gripped, but it moves very slowly. The joints that connect cartilage and ribs are hardly perceptible.

**Descriptive features of doe with BCS 4.00 (Fat):** Visual aspect of the goat: The backbone and ribs are not visible. The side of the animal is sleek in appearance. The spinous process of the lumbar vertebrae, which is encased in a thick layer of muscle and fat, is tough to touch. The spinous process runs in a straight line. The transition from the spinous to the transverse process is rounded. The outline of the lumbar vertebrae's transverse process is no longer visible. The transverse process has a smooth, rounded border with no visible individual vertebrae. Because of its width and depth, sternal fat is tough to grasp, and it cannot be moved from side to side.

Fig. 3. BCS 4.00 (FAT)

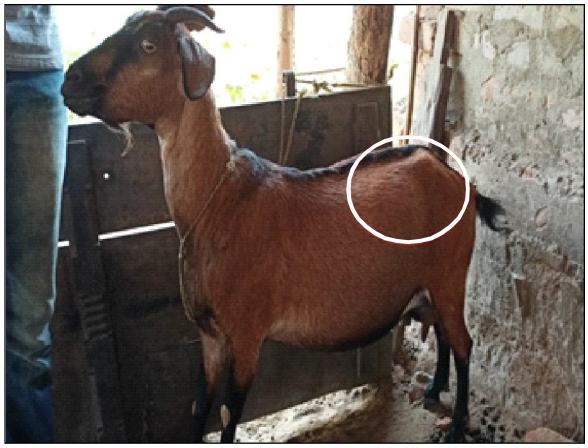

Fig. 4. BCS 5.00 (OBESE)

**Descriptive features of doe with BCS 5.00 (Obese):** Visual aspect of the goat: The backbone is buried in fat. Ribs are not visible. The thoracic cage is covered with excessive fat. Because of the muscle and fat depth, reference markings on the spinous process are lost. The spinous process creates a bulging transition from the spinous to the transverse process, as well as a depression along the backbone. It is impossible to grasp the transverse process. The sternal fat now extends and covers the sternum, joining fat covering cartilage and ribs. It cannot be grasped.

## BCS and lactation yield of goat

Does being in a negative energy balance throughout the early to mid-stages of lactation, body fat and protein must be used to compensate for this energy deficit. At this stage, the doe's BCS and milk yield are reduced to 60–80% of their peak levels, and the lactation stage has an impact on BCS, serum glucose, and milk components (Darwesh *et al*., 2013). Although the milk fat content of a doe with a high BCS (3.50-5.0) was lower in the initial two weeks postpartum when compared to a doe with a poor (1.00-2.75) and moderate BCS (2.75-3.50), doe with a poor (1.00-2.75) and moderate BCS (2.75-3.50) had a higher milk fat content (Barbosa *et al*., 2009). Enough feeding is required to maintain an optimal BCS of 3.00–4.00 at kidding. During kidding, it is vital to change the nutrition plan so that it does not get over or under conditioned. Does having a BCS of less than 3.00 at kidding mean they are unable to tolerate the stress of pregnancy and lactation, resulting in a negative energy balance and metabolic and reproductive problems. During the first four weeks after kidding, the BCS declined dramatically and increased significantly at later stages ($p<0.05$). All milk components and glucose were similarly significantly impacted ($p<0.05$) by the lactation stage (Merkhan *et al*., 2013). In Etwah goat breed between BCS 2 and 4, BCS demonstrated a positive connection with milk output, a negative association with milk protein, and no association with milk fat during early lactation (Susilorini *et al*., 2014). The Sannen goat farm produced the most milk with a BCS of 2.5 at the start of lactation (0-60 days) and a considerable fall in BCS (2.20 and 2.19) to attain peak production (Graff *et al*., 2014). The positive relationship between BCS and milk yield is due to leptin hormone transmission to the hypothalamus, which governs body metabolism. Leptin functions as an intake appetite signal by primarily acting on areas of the brain associated with energy metabolism regulation (Roche *et al*., 2009).

## Scoring and reproduction

Above a certain condition score, there was no reproductive advantage. During the follicular phase, increased FSH and lower estradiol concentrations were linked to enhanced ovulation rate in sheep with high BCS (Vargas *et al*., 1999). In sheep with a high BCS (BCS> 4.0), primary embryo wastage increased, and reproductive effectiveness decreased (Rhind *et al*., 1989). The condition score and live weight at mating positively influenced reproductive performance measured at mating and scanning (Kenyon *et al*., 2014).

The goats with lower BCS i.e less than 1.5, were three times less likely to kid as compared to the goats with higher BCS. The kidding rate was associated significantly ($p<0.05$) with BCS (Mellado *et al*., 2004), and the greater condition does the commencement of oestrous and ovulation occurred earlier ($p<0.05$) than the lesser body condition does. Serin *et al.* (2010) found that body weight and BCS have a statistically significant ($p<0.05$) effect on goat fertility during mating season. Lower BCS and body weight goats should be given higher energy feeding before breeding season. The BCS had a significant influence on the onset, end and duration of the breeding season, with does with a BCS of 2.75 having more extended periods of reproductive activity (Gallego-calvo *et al*., 2014). Widiyono *et al.* (2020) discovered that BCS 1 ovaries were acyclic, whereas BCS 2 and 3 ovaries were cyclic. The glucose, Ca,

and Mg concentrations in ovarian follicular fluid were significantly lower in goats with BCS 1 than those with BCS 2 and 3.

## Scoring and flushing

The conception rate and litter size, fertility rate, kidding numbers, triplets rate and kid birth weight were higher (P<0.05) in the high energy supplementation group is more beneficial than low energy level, and short-term supplementation with dietary energy prior to and during mating can have a beneficial effect on BCS, LBW and reproductive performance of Zaraibi does (Hafez *et al*., 2011). Melesse *et al.* (2013) reported that short-time flushing with protein and energy sources has significantly enhanced the BWT of Spanish and F1-cross in the low BCS. The effect of short-term flushing on BCS of genotypes in the poor BCS was also significant while it showed variable trends in those of high BCS. All genotypes in the low BCS favourably reacted to flushing, as evidenced by high pregnancy and kidding rates. As a response, flushing with protein and energy sources for a brief period of time has been proven to improve the reproductive efficiency of does in poor physical condition. The BCS=3.0 had a substantial effect on the birth weight (kg) of the kid/bodyweight of the doe, according to Moeini *et al*. (2014). BCS also had an effect on the kids born per kg goat. The results of the second experiment likewise showed that goats with a BCS of 3.0 (32-36 kg) had higher performance in terms of kids born per goat during mating, and that the BCS of the dam had a substantial impact on the birth weight of the kids. When the quality of the pasture nutrition decreases, the goats begin to lose BCS, especially during the summer months. In such circumstances, additional concentrate feeding (flushing) around mating time possibly boosts reproductive efficiency by raising estrus expression, conception, fecundity, and twinning rates in goats. BCS should not be lost throughout the dry period, and it should be in excellent enough shape to support the latter months of suckling and the gestation period.

## Effect of BCS on birth weight of kids/lambs

Low birth weights have been linked to poor or insufficient nutrition throughout mid or late pregnancy (Thomas *et al*., 1988; Russel *et al*., 2009). The birth weight of kids was found to be considerably affected by the BCS of their dams, according to Moeini *et al.* (2014). The BCS of the doe was found to have a significant influence on the birth weight of kids. This could be because of improper nutrition of lower BCS during the final stage of gestation.

The optimum BCS is required between 2.0 and 2.5 at insemination or mating to attain a higher litter size per female. The birth weights of the kids differed significantly based on the BCS of the doe (p<0.05). The birth weight of kids was the highest in does have a score of 3.5, 3.0 and 1.5 with 3.93, 3.83 and 3.66 kg respectively and differed significantly compared to doe BCS of 2.0 and 2.5 (Cividin *et al*., 2017). Beetal goats with higher BCS produced higher kid mass, litter size and kids having higher birth weight and this trend consistently reversed with decrease in BCS (Sharma *et al*., 2018).

In the later stage of pregnancy, the nutritional demand for the goat, especially the multiple-bearing doe is increased significantly. Under these circumstances, the doe cannot meet the increased nutritional demand if nutrition is not optimum. She must utilize body reserves to maintain fetal demand. Therefore, it could be presumed that the importance of BCS on fetal growth and kid birth weight would be greatest in late pregnancy, especially in situations where does nutrition is limited. So the farmers should give prime importance to feeding management during the dry period, and doe should be freshening properly with the desired score and live weight. Regardless of the genetic makeup of the doe, adequate feeding is essential to achieve optimum BCS at kidding. The dietary amount should be regulated properly, and doe does not become overweight or underweight. The doe with higher BCS during kidding (3.0 – 4.5) probably produce more colostrums and milk during lactation and suffer fewer

incidences of metabolic diseases. So doe having optimum BCS can nurture their kids very effectively, which ensures higher weaning weight. The does having lower BCS (<3.0) and being unable to handle lactation stress causes low milk yield, negative energy balance and various metabolic disorders (Sahoo, 2022).

## Scoring and buck management

Bucks having BCS of 3 to 3.5 on a scale of 1 to 5 should join the breeding season (1 being very thin and 5 being overweight). Breeding stamina will be harmed if the buck is too slim because some females will cycle more than once before conception. This can result in a longer kidding period. Alternatively, obese animals may lack the vigour needed to serve huge numbers of does. Due to poor feed consumption and excessive activity, they have a low BCS throughout their reproductive phase. During this time, they will be more active, competing with other males, pursuing does, and sprinting quickly, among other things. They gradually regenerate their BCS after completing the reproduction cycle (Ghosh *et al*., 2019). They require additional grain in addition to grazing to achieve the desired BCS during the breeding period.

## BCS and disease incidences

During lactation, cows with a low BCS are more susceptible to mastitis, and mastitis prone cows are more likely to have a low BCS. Throughout the lactation, daily estimates of genetic connections between score and mastitis were moderate to strong, getting stronger as the lactation proceeded. Throughout the lactation, the average daily genetic connection between BCS and metabolic illness was 0.438 (0.125). The incidence of mastitis and metabolic disorders is genetically linked to a lower BCS during lactation (Loker *et al*., 2012). Costa *et al.* (2012) found a link between condition score and parasite illnesses in Caninde goats (P = 0.23). The goats with desire BCS will be less susceptible to metabolic disorders, diseases, mastitis and reproductive problems (Koyuncu and Altincekic, 2013). Before the reproduction season begins, the does should have a 3.0 score. If BCS>3.5 causes pregnancy toxaemia (ketosis), retained placenta fatty liver, abomassal displacement and dystocia, and if BCS 2.0-2.5 causes poor kid survival and milk yield, the BCS for pregnant doe should be 3.0-3.5. It should be 3.0-3.5 for kidding and 2.5-3.0 for lactating does. BCS should never fall below 2.0-2.5, since this will result in anestrous, non-ovulatory heat, shorter heat, repeat breeding and sterility (Ghosh *et al*., 2019).

## Conclusions

BCS is useful for detecting changes and unexpected conditional losses that are hard to detect based on the animal's exterior appearance. It is used to assess current and prior feeding programmes, in addition to the health of a particular doe. BCS monitoring in does at regular intervals (at least 15 days) or during critical life stages such as before the dry period, on the date of kidding, 30-60 days after kidding, one month before mating, or on the date of mating can help identify the does in the flock who use their energy reserves more efficiently.

When a farm's or flock's overall score drops significantly, preventative actions including deworming, adequate nutritional supplements (in terms of energy and protein), vaccination against common diseases, and pasture rotation are vital. In contrast, if the herd's overall physical condition begins to improve, the producer/farmer should reduce extra feeding. Overfeeding can result in production and/or animal losses, as well as lost profitability, if you ignore an animal's bodily condition and wait until it becomes either thin or excessively fat. As a result, a farm manager should continue to feed and manage the herd/flock so that the appropriate BCS is maintained.

## Future research

It's necessary to create a BCS grading scheme for our goat based on the breed's distinct morphological traits. For different goat breeds in India, the best BCS for various stages

of the goat life cycle should be standardized. The impact of scoring on several aspects of production, reproduction, growth, and disease occurrences of indigenous breeds reared in diverse agro-climatic zones of the country should be studied in depth. It's critical to create a BCS-based feeding system for meat, milk, multipurpose, and fiber-producing goats raised on a farm or in a range/pasture system.

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