

A Novel Method of Understanding and Identifying Feeding Management Problems in Dairy Cows



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ABSTRACT: There has been a considerable increase in the number of exotic dairy cows in the country through crossbreeding program. Although the increasing number of exotics cows have brought several benefits, it was envisioned that there is a disparity between feeding management and cows' genetic merit. The discrepancy was evidenced by the low milk production from genetically merit cows wherein it believes that reasons are associated with ignorance and lack of knowledge on managing modern dairy cows. Therefore, a novel approach to identifying dairy cows' problems related to feeding management was introduced for Bhutanese farmers. Under this concept, four noble truths are used to educate farmers on the causes of problems and provide solutions for them. Further, to create awareness of body condition score as a key management tool in feeding dairy cows.

KEYWORDS: body condition, crossbreeding, feeding management, noble truths

I. INTRODUCTION

In Bhutan, cattle have been essential component of subsistence agriculture farming since time immemorial. Indigenous cattle are the most common breed, typically managed throughout the year under low input-low output systems based on free forest grazing (1). The grazed forest serves as the cheapest source of fodder for cattle, despite coarse and low nutrient compositions supporting the country's conventional cattle production (2). Over the years, the government has introduced a crossbreeding program to encourage exotic dairy breeds to improve the productivity of native cattle, reduce imports of dairy products, and mitigate the environmental impact mainly causes by overgrazing (3). Therefore, the crossbreeding programs were supported by projects and farmers chose best cattle breed for milk production across the country. Furthermore, the breed improvement program was favoured by the implementation of artificial insemination (AI) and structural changes in fresh milk marketing through the establishment of farmers' groups and cooperatives among others (3).

Today, undoubtedly, Bhutan has a good stock of genetically merited cows making national herd achieved through crossbreeding program for milk production. The exotic lactating cows were stall-fed, and a small quantity of concentrate feed supplements are offered to enhance milk production but feeding managements have not much changed. Consequently, the overgrazing pressure on the forest has decreased and expected to decline further in the future losing traditional importance on forest grazing (2, 3). Although the crossbreeding has reduced the pressure on the forest, it has neither reduced the number of cattle heads per farm nor minimize imports of dairy products. Therefore, the crossbreeding program has not been able to fulfil the demand of dairy products in the country (3), despite the considerable number of cows available with a genetic capacity to produce milk in volumes.

Reality is that the crossbreeding has increased cows' genetic capacity to produce more milk, however, genes alone do not suffice to produce optimal milk without the support of adequate nutrition. Higher producing cows have greater nutrient requirements (4, 5) than low producing cows and crossbred cows require more feed than local cows because they produce more milk and are bigger (6). The contemporary practice of forest grazing with casual supplements is not an appropriate feeding strategy for dairy cows (2). The poor feeding management practices are displayed in different manifestations, for example, low milk production from crossbred cows, losing body condition score, delaying the age of puberty, and reproduction among others (7, 8). Presently, these two problems are overlooked and neglected due to farmers' ignorance and mindset and/or lack of scientific understanding of modern dairy cows. Moreover, the proper management of dairy cows is a complicated subject that

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requires a higher level of learning and cognitive learning process (9). For this reason, our farmers have yet to experience genetic milk potential of an individual cow, despite the genetic capacity to produce more milk. This misconception and knowledge gap have resulted in a risky fraught and indicated that dairy cows are being far from included as an important business partner. This gives dairy researchers and extension agents more challenges to educate farmers on modern dairy cows feeding and management.

To educate farmers on the better nutritional management of modern dairy cows, to improve overall herd health through the promotion of nutrition and to make farmers aware of losing body condition as a sign of problem state: we are introducing the concept of four noble truths blending animal science with religion, which is a novel approach. This concept's objectives are to emphasize the nutrient requirements of dairy cows by identifying problems near-real-time and educating how to use body condition score as a key management tool.

II. HYPOTHETICAL APPROACH

Four Noble Truths

Four Noble Truths are a simple formula applied in the teachings of Buddhism. The teachings of Buddha are contained within the teachings of Four Noble Truths. Application of Four Noble Truths concept in dairy production allows us the cognitive understanding of problems associated with dairy cows regarding feeding management. The truth must be penetrated by fully understanding the losing body condition of cows on lactation as problem state.

Dukkha/Suffering

Dukkha in Buddhism is unbearable suffering or pain that is not perpetual but subject to change at any time (10, 11). Human beings' sufferings are shared emotionally and verbally with each other although some remain repeatedly do wrong things without sensory consciousness on the real causes of the problem (10). Similarly, dairy cows can be in the state of Dukkha (suffering) due to the natural phenomena of life. Since cows cannot share their suffering verbally, the Dukkha is exhibited in the form of losing body condition. Because the conventional practice of forest grazing has neither meet the nutrient requirements of cows nor owners have provided supplement feeds sufficiently at home. Therefore, Dukkha is predominated in subsistence farming, where cows are allowed free forest grazing and raised as an integral part of the agricultural farming system. In our context, cows subjected to Dhukka are evidence by low milk production from crossbred cows, extended calving interval, increased age at puberty, prolonged postpartum heat, and most importantly, the appearance of cows' bony structure. One should recognize that lean cows display Dukkha due to inadequate feeding and immediate attention to feeding practices is desirable. Therefore, cows' body condition score serves as a pointer for the scientific feeding management of dairy cows (12).

Samudaya/Cause

Samudaya in Buddhism is the cause of suffering or problem due to desire of unlimited wants to gain pleasure or once satisfaction (10). Dairy cows once bought and/or owned through crossbreeding, the desire for milk from a cow has increased regardless of feeding and management practices. Since feeding management has not much changed despite the genetic improvement of cows. Our dairy farmers still practice forest grazing and assumed that cows have had enough roughages from the forest which is untrue. Reality is that cows must have spent maximum time in search for grasses and consequently, the dry matter intake (DMI) from forest grazing is very low. Even cows that grazed well-developed pasture at overseas have reported low DMI due to cows not having enough pasture (13). The fact is that low DMI from the forest grazing and casual supplements at home has never met cows' nutrient requirements. Subsequently, lactating cows use their body reserve fat to produce milk, whereby losing body condition (14, 15). Thus, the Samudaya/ causes of losing body condition, which is suffering for cows are attributed to low DMI, and ignorance of farmers due to lack of scientific understanding of cows and misconceptions that genes will give more milk. As such one should have adequate knowledge for DMI intake from forest grazing to advocate supplement feeding at home for optimal milk production.

Nirodha/Realize

Nirodha in Buddhism is a stage where enters the right path for the complete cessation of dukkha/suffering through realization (10, 16). The suffering of cows can bring in to complete cessation through the realization of feeding management practices. Scientifically, feeding management is performed under three factors affecting the lifetime milk production: age at first calving, the number of calves born and milk yield per lactation (17). If lactating cows are fed properly according to daily requirements (maintenance + milk production) and do not lose body condition throughout the lactation, it indicates that cow is free from suffering and reaches genetic milk production potential (18). On this condition, we can say that owner has a nirodha state of knowledge in dairy farming, which means doing the right things in feeding dairy cows. The nirodha state of knowledge or no

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problem state can be used as a benchmark for comparing and identifying each lactating cows' performance after calving. In 2 months of calving, if a cow loses body condition, it indicates the inadequate feeding and cannot realize as a problem will have a carryover effect on subsequent reproduction and production performance as a loss. Therefore, without the nirodha state of knowledge, problems are invisible and not recognizable, which we are currently experiencing in the field. Thus, the losing body condition should be realized as the problem of dairy cows and should be monitored constantly for fulfilment of its potential.

Magga/Path

Magga deals with the ways to out from suffering (10). The suffering of cows can eliminate through properly feeding without making to lose body condition. Cows must feed balance ration that complements forest grazing through the supplement. Right practice of feeding and management determines the productive life of cows and profitability of farms (18). By adopting sound feeding strategy, the path will be fully developed for the corrections of many odds in dairy farming in the country. The desirable pathways to successful dairy farming are: fine tuning of ration and supplemental feedings, reduction of calving interval and postpartum heat, and alteration of the starting point of productive life. Most importantly, in our case, the development of sound feeding guide for dairy farmers based on the available feed resources in addition to education feeding management through this concept. Therefore, emphasizing parameters are management procedures to relieve cows' suffering and attain lifetime milk production without any penalty for dairying through mismanagement.

III. DISCUSSIONS

Genetic Composition and Milk Yield of Cows

Bhutan has 317451 cattle inclusive of yaks and buffalos with total milk production of 55906915 litres. Out of which 112633 cattle population is exotic predominated by Jersey Cross (107281), Brown Swiss cross (3893), Jersey pure (476), Holsten Friesian (966) and Brown swiss pure (17) (DoL, 2018). Wangdi, Bhujel (19) studied the productive performance of crossbred cows and found that milk production from pure Jersey cows was 5.07 kg/day in summer months matching available grasses. On the other hand, cows at overseas with the same genetic merit cows reported producing 22.2 litres/day under the pasture-based dairy system (20). This shows compelling evidence that there is an enormous gap between genetic make-up and nutritional management of dairy cows for milk production, not to mention other parameters for a cow's productive life. Past study has reported that nutritional constraints and management have limited the genetic milk production potential of cows (6).

Nutrient Intake at Forest Grazing and Supplements

Feed quality and quantity determine the productivity and efficiency of cows. Even in the well-developed pasture, intake of cows is affected by pasture mass, sward height, digestibility, nutrient compositions and grazing management (21, 22). Unlike in the overseas, dairy farmers in Bhutan depend on natural grassland and forest to meet their cows' herbage requirements. Several authors have reported that about 20 % to 24% of dry matter comes from forest grazing for animals based on the estimation (23). The mountainous terrains and fast deterioration of natural grassland are the major constraints bringing herbage shortage despite the poor quality and less quantity in nature. Grazing grasslands are exploited by the expansion of agricultural activities and urbanization. The limited grasslands are overgrazed and become a source of conflict for individual and community. The availability of fodder supply varies between climatic conditions and seasons in addition to farming practices (24). Usually, cows graze fresh grass during the summer season and during lean season relies on crop residues mostly paddy straw and stover. However, crop residues' quality and quantity vary with climatic conditions, harvest time, farm condition, and management (25).

Challenges in Pasture Development

The concept of developing improved pasture for feed and fodder supply is not new and it has been initiated many decades before. However, due to small landholding and priority for agriculture crop cultivation leads to small scale pasture development. Besides, the existence of free forest grazing has never motivated farmers to develop improved pasture. Feeding of agriculture by-products and poor knowledge of dairy nutrition is challenging factors for pasture development. Today, despite unwavering support and inputs, the livestock sector meted with poor response in pasture development. Because of this, the development of animal nutrition remains far behind to achieve and consequently the productivity of cows is reported as substandard in terms of growth, puberty, production and reproduction.

Misconceptions and Realities

There are several misconceptions in the dairy sector which do not favour genetic milk production. It is a common assumptions is that most of our farmers and commoners think that genes will produce milk. This is a dangerous fraught for the dairy sector that yanks the milk production. A clear example is that a farmer wants to buy a pure Jersey and have an expectation of milk in volumes. There is no question of what and how to feed to produce the expected milk yield. Some farmers will say if we can feed

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well, even our native cows are producing a considerable amount of milk. This is something we need to realize with dairy nutrition. Genetic merit of cows has increased the genetic capacity for milk production and actual milk is produced from the feed that consumed. Therefore, feeding management of dairy cows is equally important as a dairy breed is. We have been promoting dairy genes that have high milk production capacity and managed under confinements at overseas through the breed improvement program. No wonder these cows produce voluminous milk and under clearly understood principle optimal nutrition under a confined feeding system. The same breed of cows producing less at free forest grazing often become untrue for many Bhutanese farmers.

Cows on grazing are expected to be consumed enough roughages and a very little quantity of supplements in the form of concentrate or agriculture by-products are offered to milking cows. The genetic milk production would have been experienced should there is strategic supplementary feeding guideline. So far research has not quantified dry matter intake (DMI) of free forest grazing cows. Therefore, provision of supplements to dairy cows with unknown intake from the forest has become problematic for both extension workers and farmers alike. Quantifying DMI of free forest grazing cows will be useful to formulate precise supplement rations that will complement free forest grazing. Ultimately, through proper supplements, genetic milk production will be realized. The irony is that, at present, none of our dairy farmers could achieve genetic milk production from cows despite he or she has Jersey cross or pure Jersey. Because the cow management and nutrition are being still overlooked as the traditional system predominates dairy production concept.

To change dairy production from free forest grazing to pasture-based or towards a confinement system is a long-term business decision. It must consider all costs involved and should have strong policy support for smooth transaction of the production system based on the breed improvement. Most importantly, the supplementary feeding guide should be in place for farmers and extension workers to optimise milk production from the exotic herd. In foreseeable future, without proper nutritional management of dairy cows, the genetic production potential of a cow, exotic/native will not be meted unless education and awareness is created among our farmers.

VI. CONCLUSIONS

Identification of problem-related to feeding management of dairy cows needs a high level of learning and cognitive learning process. The introduction of novel problem analysis concept, blending religion and animal science provides a virtual advantage for dairy researchers and extension workers to educate farmers more meaningfully. This concept is expected to be used by livestock professionals as a powerful tool for creating awareness of cows' inadequate feeding. Besides, it also provides an opportunity to educate on cows' body condition score as a pointer for management. Since this is a theoretical approach, future research would measure the level of understating about feeding dairy cows and the effect of milk production through this novel concept.

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