RESEARCH ARTICLE

Assessment of Feeding Practices Followed by Dairy Buffaloes Owners in Bhavnagar District of Gujarat State

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Abstract

A field survey was conducted between March and May 2025 in the Bhavnagar district of Gujarat state to assess the feeding practices followed by dairy buffalo farmers. Using a multistage random sampling technique, six talukas (Talaja, Sihor, Palitana, Bhavnagar, Mahuva, and Umrala) were selected, with two villages from each taluka and ten respondents per village owning buffaloes yielding ≥8 kg milk/day. Data on 153 buffaloes from 120 farmers were collected through structured interviews and analysed. All farmers (100%) adopted stall-feeding, with none relying on grazing. A majority (77.50%) fed a combination of concentrate, green fodder, and dry fodder, while 21.67% used concentrate and dry fodder only, and 0.83% used concentrate with green fodder. Most farmers (92.50%) fed concentrates twice daily, primarily in dry form (61.67%), with 38.33% soaking before feeding. Roughage processing was rare, with only 7.50% and 4.17% practicing chaffing green and dry fodder, respectively, before feeding. Mineral supplementation was minimal (11.67%). Water was provided *ad libitum*, though frequency varied. Concentrate feeding during the dry period was reported by limited farmers (22.50%), while 72.50% offered pregnancy allowances and 74.17% provided extra feed and supplements to buffaloes post-calving. Identified gaps in the existing feeding practices were addressed with suitable recommendations.

Key words: Bhavnagar district, Dairy buffalo, Feeding practices, Gujarat state.

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Introduction

Livestock farming plays a key role in improving the socio-economic conditions of rural populations, with about 70% of rural households depending on it for supplementary income (Anonymous, 2024). India ranks first in global milk production, mainly due to its large buffalo and cattle population rather than higher milk yield per animal. Feeding of dairy animals accounts for 60-70% of total dairy farming costs, making balanced and economical feeding essential. However, dependence on crop residues, feed scarcity and mineral deficiencies limit their productivity. Dairy animals with smallholder farmers often face underfeeding, while overfeeding in organized farms causes wastage and metabolic issues.

Major challenges in livestock feeding practices include high input costs, poor management and limited awareness of scientific feeding. Adopting balanced rations, suitable feed ingredients and improved management practices can enhance milk yield, reduce costs and ensure sustainable dairy farming in India. Hence, an area specific survey of feeding practices followed by dairy farmers is important to identify regional feed resources and to develop area-specific strategies for improving livestock productivity and sustainability (Ramana *et al.*, 2026). Based on the facts, a field survey was conducted in the Bhavnagar district of Gujarat to study the existing feeding practices followed by dairy buffalo farmers and to propose necessary improvements within the available feed resources.

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Materials and Methods

The study was conducted between March and May 2025 in the Bhavnagar district of Gujarat state (India) using a

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multistage random sampling technique for selecting the respondents. The study was conducted in six talukas, *viz*., Talaja, Sihor, Palitana, Bhavnagar, Mahuva and Umrala of the Bhavnagar district. Two villages were randomly selected from each selected taluka. The talukas and villages within talukas selected were geographically located apart in direction and truly represented the animal husbandry practices of the district and talukas, respectively. From each village, 10 respondents who own dairy buffaloes producing ≥8 kg of milk per day were selected. Information on total 153 dairy buffaloes was obtained from interviews with 120 farmers. Information regarding the amount and types of feeds and fodder being offered to the buffaloes, their approximate rate of daily intake by individual buffaloes, milk yield and its fat % for individual buffaloes, feeding schedules, feeding pattern etc. was collected with the fair degree of precision from individual farmer using a well-structured questionnaire. The two-way chi-square test was used to know the distribution of respondents in six talukas for particular practices using a MedCal statistical software.

Results and Discussion

In the Bhavnagar district, dairy buffaloes are typically reared under mixed farming systems, where in crop cultivation and livestock rearing are closely interlinked. Farmers primarily depend on locally accessible feed resources and most of the feeding methods followed are traditional rather than scientific. The ration of buffaloes mainly comprises green fodder, dry roughages, concentrates and various crop residues or byproducts. The type and quality of feed provided to the animals are greatly affected by the seasonal availability of fodder. The feeding practices observed during the survey are summarized in Table 1.

Feeding System

All buffalo farmers (100%) in the Bhavnagar district adopted stall feeding. None of the dairy farmers maintained their animals solely on grazing or on grazing along with stall feedings. In Gujarat, stall feeding is observed as the predominant system adopted by dairy animal owners across the state as reported by various workers in Surat, Valsad and Junagadh districts (Sabapara and Fulsoundar, 2016; Patel *et al*., 2019; Dodiya *et al*., 2023). However, semi stall-feeding was also reported as preferred system among buffalo owners in Navsari district by Sabapara (2016), in Porbandar district by Pata *et al*. (2018) and in Panchmahal district of Gujarat by Khadda *et al*. (2017). Research conducted in states other than Gujarat also revealed variations in the feeding systems adopted by dairy farmers (Godara *et al.,* 2018; Kumar *et al.,* 2019; Varma *et al.,* 2021).

Types of Feed Offered

The majority of farmers (77.50%) provided their buffaloes with a combination of concentrate, green fodder and dry fodder. About 21.67% of farmers offered concentrate and dry fodder only because of limited availability of green fodder due to lack of irrigation. The green fodder only was being fed along with concentrate by 0.83% of farmers as it is not adequately available in their area. A significant ($p < 0.05$) difference in types of feed being fed to buffaloes by respondents was found among the six talukas as is reported for cattle from the same district (Ramana *et al.*, 2026).

Feeding of Concentrates

All respondents (100%) in the district, whether they kept just one animal or managed an entire herd provided them the concentrate feeds available locally. The commonly used concentrates in the district included cottonseed cake, cottonseed, groundnut cake, Sarvotam dan (compound cattle feed manufactured by Bhavnagar District Cooperative Milk Producers' Union Limited), Maahi dan (compound cattle feed manufactured by Maahi Milk Producer Company Limited) and other commercial readymade concentrate mixture. The data (Table 2) revealed that only 19.16% buffalo owners used BIS Type II compound cattle feed either alone or along with other concentrate ingredients indicating a lack of awareness about balance cattle feed amongst the dairy farmers. Most dairy farmers relied primarily on the use of different readymade concentrate mixtures followed by the use of cottonseed cake either individually or combined with other concentrate ingredients accessible in the district. No farmers in the district prepared homemade concentrate mixtures. Instead, all respondents (100%) across the surveyed talukas offered concentrates separately using either single concentrate ingredient or mixture of two or more concentrate ingredients for feeding their buffaloes. These findings were consistent with earlier studies from Gujarat showing a preference for ready-made or compound cattle feed over homemade concentrates (Khadda *et al.,* 2017; Bloch, 2019). However, feeding homemade concentrate mixtures either alone or along with compound feed has also been reported in certain regions of Gujarat state (Sabapara *et al.,* 2010, 2016; Naliyapara *et al.,* 2021; Dodiya *et al.,* 2023). Research conducted in other states also showed notable differences in concentrate feeding practices (Ahirwar *et al.,* 2010; Varma *et al.,* 2021).

Frequency of Concentrate Feeding

Majority of respondents (92.50%) in the district offered concentrates to their buffaloes twice daily, while very few respondents (7.50%) provided them once a day. A statistically significant difference ($p < 0.05$) was noted among respondents from the six talukas regarding the

Table 1: Distribution of the dairy buffalo farmers according to feeding practices followed in different talukas of Bhavnagar district

Practices	Criteria	Talaja (n=20)	Sihor (n=20)	Palitana (n=20)	Bhavnagar (n=20)	Mahuva (n=20)	Umrala (n=20)	Overall (n=120)	Overall (%)
Feeding system	Stall feeding	20	20	20	20	20	20	120	100.00
	Grazing only	0	0	0	0	0	0	0	0.00
	Stall feeding + grazing	0	0	0	0	0	0	0	0.00
Types of feed offered	Concentrate + Dry fodder	3	0	2	9	4	8	26	21.67
(χ^2, 22.6* P =0.0123)	Concentrate + Green fodder	0	1	0	0	0	0	1	0.83
	Concentrate +Green + Dry	17	19	18	11	16	12	93	77.50
Types of concentrate	Separate concentrate mixture	0	0	0	0	0	0	0	0.00
	Homemade concentrate mix.	20	20	20	20	20	20	120	100.00
Frequency conc. feeding	Once	0	3	4	0	1	1	9	7.50
(χ^2, 9.7 P=0.0833)	Twice	20	17	16	20	19	19	111	92.50
Processing of conc.	Dry/ As such	9	11	18	4	14	18	74	61.67
(χ^2, 31.6** P<0.0001)	Soaking	11	9	2	16	6	2	46	38.33
	Cooking	0	0	0	0	0	0	0	0.00
Process of fodders	Yes	4	1	4	0	0	0	9	7.50
(χ^2, 14.0* P = 0.0153)	No	16	19	16	20	20	20	111	92.50
Feeding of min mix	Yes	3	1	2	5	3	0	14	11.67
(χ^2, 7.4 P=0.1900)	No	17	19	18	15	17	20	106	88.33
Frequency of watering	2 times	6	5	6	5	5	4	31	25.83
(χ^2, 4.7 P=0.9100)	3 times	13	12	12	11	13	11	72	60.00
	4 times	1	3	2	4	2	5	17	14.17
Feeding of conc.	Yes	3	8	4	8	1	3	27	22.50
during dry period	No	17	12	16	12	19	17	93	77.50
Pregnancy allowance	Yes	14	12	15	14	15	17	87	72.50
(χ^2, 3.4 P=0.06408)	No	6	8	5	6	5	3	33	27.50
Special feeding after	Yes	12	13	18	17	18	11	89	74.17
calving (χ^2, 13.3* P=0.021)	No	8	7	2	3	2	9	31	25.83

**p < 0.01, *p < 0.05

Table 2: Types of concentrate being fed to dairy buffaloes in Bhavnagar district Types

Types	Frequency (n=120)	Percentage (%)
A. **Homemade concentrate mixture**	00	00
B. **Separate feeding of concentrate mixture**		
Cottonseed cake alone	36	30.00
Groundnut cake alone	4	3.33
Cottonseed alone	1	0.83
Compound cattle feed* alone	18	15.00
Readymade concentrate mixture	49	40.83
Cottonseed cake + groundnut cake	1	0.83
Cottonseed cake + readymade concentrate mixture	3	2.50
Cottonseed cake + Compound cattle feed*	1	0.83
Cottonseed cake + wheat bran	1	0.83
Groundnut cake + readymade concentrate mixture	2	1.67
Compound cattle feed* + readymade concentrate mixture	3	2.50
Compound cattle feed *+ groundnut cake	1	0.83
Total (A+B)	**120**	**100**

*BIS type II compound cattle feed manufactured by Bhavnagar District Cooperative Milk Producers' Union Limited and Maahi Milk Producer Company Limited

frequency of concentrate feeding. Similar practices had been reported by Sabapara (2016), Khadda *et al*. (2017), Bloch (2019) and Naliyapara *et al*. (2021) in their surveyed area.

Processing of Concentrate

Majority of respondents (61.67%) in the district offered concentrates as such in a dry or unprocessed form without any pretreatment, while 38.33% soaked the concentrates before feeding. No farmers in the district were found to cook concentrates before feeding to their buffaloes. A highly significant difference ($p < 0.01$) in concentrate processing practices was observed among respondents across the six talukas. This finding aligned with the reports of Bloch *et al*. (2022), who reported that only 35% of respondents in the rural areas of Jamnagar district soaked concentrates before feeding. However, several other studies from the Gujarat state documented a higher prevalence of concentrate soaking before feeding (Sabapara and Fulsoundar, 2016; Khadda *et al.,* 2017; Patel *et al.,* 2019; Naliyapara *et al.,* 2021; Ramana *et al.*, 2026). Feeding of processed concentrate either soaked or cooked has also been reported in survey studies conducted by the several researchers in states other than Gujarat (Manohar *et al.,* 2014; Kumar *et al.,* 2019).

Feeding of Roughages

Green fodder was available at 78.33% of the households for buffalo feeding and was extensively grown across the Bhavnagar district. The types of green fodder found during the survey in the study area included jowar, marvel grass, Napier, maize and lucerne with jowar being the most preferred. Green jowar, Napier and lucerne were mostly used to feed dairy buffaloes because of their large scale cultivation during the study period. Dry fodder as crop residues was available with almost all households (99.17%) and was the major component of the dairy buffalo ration. Farmers usually stored these materials at home so they could feed their buffaloes throughout the year. Jowar hay was the most widely used dry roughage for feeding followed by groundnut gotar in the district.

Processing of Roughage

Processing of roughages before feeding was found to be a very uncommon practice in the district. Only 7.50% and 4.17% respondents reported chaffing of green and dry fodder, while the majority (92.50%, 95.83%) provided it without chaffing. A significant variation ($p < 0.05$) was observed among respondents from the six talukas regarding processing green and dry fodder. Although roughage processing methods such as chaffing can significantly improve roughage utilization, reduce wastages and enhance feed intake, most farmers in the district were unaware of these benefits and/or had lack adequate resources for adopting proper fodder processing techniques. In Gujarat, the practice of feeding roughage without any processing to dairy animals is highly prevalent among dairy farmers in different districts as revealed by earlier workers (Sabapara and Fulsoundar, 2016; Khadda *et al*., 2017; Bloch, 2019; Patel *et al*., 2019; Naliyapara *et al*., 2021; Ramana *et al.*, 2026). The present findings were in agreement with these reports. However, in states other than Gujarat researches revealed variation in practices of roughage processing (Godara *et al.,* 2018; Kumar *et al.,* 2019).

Supplementation of Mineral Mixture

Most farmers (88.33%) in the study area did not provide mineral mixture and only 11.67% reported supplementing it. The primary reasons for not offering mineral mixture were its relatively high cost and the belief among farmers that these supplements are unnecessary and would only add financial burden to them. A review of earlier studies conducted in various regions of Gujarat state indicated that mineral mixture supplementation is not a routine practice among dairy farmers in the state. Pata *et al*. (2018) found that only 9% of buffalo owners in Junagadh and Porbandar districts used mineral mixture, while in Jamnagar district Bloch *et al*. (2022) reported that 88.33% farmers did not provide mineral mixture to their animals. Similar research conducted in other parts of Gujarat also revealed that practice of supplementing mineral mixture to dairy animals was not a common practice followed by farmers in the areas surveyed (Sabapara *et al.,* 2010; Sabapara and Fulsoundar, 2016 ; Khadda *et al.,* 2017; Naliyapara *et al.,* 2021; Dodiya *et al.,* 2023; Ramana *et al.*, 2026). The findings of the present study were in agreement with the above reports. Similar trend has been reported in states other than Gujarat where very few animal owners provided mineral mixtures to their animals (Sinha *et al.,* 2009; Kishore *et al.,* 2013; Manohar *et al.,* 2014; Gaikwad *et al.,* 2019; Barman *et al.,* 2023). In contrast, Ahirwar *et al*. (2010) reported that most of the dairy farmers in Indore district of Madhya Pradesh regularly supplied mineral mixture to their buffaloes

Watering the Animals

All the respondents provided water to their buffaloes *ad libitum* in quantity but the daily frequency of watering was limited. About 60%, 25.83% and 14.17% of the respondents provided water to their animals three times, two times and four times a day, respectively. A review of earlier studies conducted in various regions of Gujarat state revealed that most livestock farmers in Gujarat watered their animals three times a day (Sabapara, 2016; Khadda *et al.,* 2017; Bloch, 2019; Patel *et al.,* 2019; Naliyapara *et al.,* 2021). The results of the current study supported these earlier observations.

Feeding during Dry Period

Large proportion of farmers in the study area did not offer concentrate feeds during the dry period as only 22.50% of respondents provided concentrate feed to buffaloes during the dry period. A significant variation ($p < 0.05$) was observed among respondents from the six talukas regarding concentrate feeding practices during the dry period. Although concentrates are essential for supporting fetal growth and preparing the udder for the next lactation, most farmers considered them unnecessary during non-lactating phase mainly because of the additional cost. The findings of the present study highlight a substantial knowledge gap among most farmers in Bhavnagar district regarding the importance of providing concentrate feed during the dry period. However, some progressive dairy farmers in several parts of Gujarat practiced the feeding of concentrates to growing heifers and to heifers in late gestation (Sabapara and Fulsoundar, 2016; Patel *et al.,* 2019; Dodiya *et al.,* 2023).

Pregnancy Allowances

Most of the farmers (72.50%) in the surveyed area provided pregnancy allowances to their buffaloes during the advanced stage of gestation, indicating considerable awareness among farmers that increased nutrition during

late pregnancy is essential for supporting the growing fetus and boosting milk production in the ensuing lactation. Farmers usually offer an extra 1-2 kg of concentrates, mainly cottonseed cake and commercial concentrate mixture over and above the buffaloes' routine feed during advance pregnancy particularly at 10-15 days prior to calving. These findings were in agreement with the earlier researches conducted in different parts of Gujarat (Sabapara *et al.,* 2010; Sabapara and Fulsoundar, 2016; Patel *et al.,* 2019; Dodiya *et al.,* 2023). In this context, research findings from states other than Gujarat (Jatolia *et al.,* 2017; Godara *et al.,* 2018) also aligned with the present results. However, studies from Andhra Pradesh (Kishore *et al.,* 2013) and Maharashtra (Gaikwad *et al.,* 2019) reported that only 3.50% and 16.98% of farmers, respectively, provided additional concentrates to pregnant buffaloes.

Special Feeding after Calving

The majority of respondents (74.17%) in the district followed the practice of offering extra feed and supplements such as ghee, jaggery, jaggery dissolved in lukewarm water, ghughari and edible oil etc (calving mixture) to buffaloes after calving mostly to freshly calved animals for a period of 7 to 15 days, while 25.83% did not give any special feeding to buffaloes after calving. A significant difference ($p < 0.05$) was observed among respondents from the six talukas regarding this practice. Most farmers were following this practice because of their practical understanding that freshly calved animals require more nutrients to meet the increased demand during early lactation and to support higher milk yield. This practice has been widely adopted among dairy farmers across various regions of Gujarat state as revealed by findings of Khadda *et al*. (2017) in Panchmahal district, Bloch (2019) in Jamnagar district, Patel *et al*. (2019) in Valsad district, and in Bhavnagar district (Ramana *et al.*, 2026).

Conclusions

The feeding practices adopted by dairy buffalo farmers in Bhavnagar district were largely traditional, based on locally available feed resources, and most farmers followed a stall-feeding system. There was a lack of awareness among farmers about balanced feeding. The use of balanced compound cattle feed supplied by dairy cooperatives was limited. Most farmers were unaware of the benefits of proper fodder processing or lacked adequate knowledge and resources to adopt such techniques. Concentrate feeding during the dry period was minimal; however, the majority of farmers provided additional concentrate during late pregnancy and offered special feeding after calving. Supplementation with mineral mixtures was also uncommon among farmers in the study area. It is recommended to feed chaffed roughages rather than unprocessed, use a mix of concentrate ingredients or prepare homemade mixtures, or opt for compound cattle feed as per BIS specification. Farmers should provide mineral mixtures at 40-50 g per buffalo daily to maintain mineral balance, and offer 1-1.5 kg concentrate during the dry period to sustain body condition, support fetal growth, restore nutrient reserves, and prepare buffaloes for the next lactation.

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