Nepalese Journal of Agricultural Sciences, January, 2025, Volume 28
eISSN 2091-0428; pISSN 2091-041X; esjindex ID = 6279

A STUDY ON FEEDS AND FEEDING PRACTICES OF DAIRY ANIMALS IN SMALL SCALE FARMS OF KAVRE DISTRICT, NEPAL

Bhumika BALAMI[1*] and Rupendra CHAULAGAIN[1]
Himalayan College of Agricultural Sciences and Technology, Kathmandu
***Corresponding Author's email**: vumikabalami@gmail.com

ABSTRACT

The study was conducted in selected wards of Panchkhal Municipality, Kavre, Nepal. A structural questionnaire was used to collect the primary information from the farm. The information collected were farm demographics, feeding practices, types of feed used, and the challenges encountered in ensuring adequate nutrition for their animals. The results revealed zero grazing, was the predominant farming method among dairy farmers in the area. Approximately 80-88% of the dairy animals raised were of crossbred type (79% Jersey cross and 8% Holstein Friesian cross). Dairy farmers primarily utilized locally available feed resources such as seasonal green grasses, forage crops, and crop residues, complemented by feedstuffs like broken rice, rice bran, wheat bran, rice polish, mustard cake, corn flour, molasses, salt, and thyme seeds. Mostly the feed was fed to the animals in the traditional method termed as "kudo" (meaning mixing of all available feed resources with water) to give to the productive animals. This study revealed that a total of 21 (51%) of respondents cultivated their fodder grass, with Napier grass (Pennisetum purpureum) being the most favored, followed by fodder oats (Avena sativa), and other grass varieties. About 33 (80.5%) of the farmers favored the artificial insemination (A.I) method, whereas 8 (19.51%) respondents opted for natural mating as their preferred breeding technique. The average milk yield per day was 10.26 liter. These findings provided valuable insights into the intricate challenges faced by regional dairy farmers, shedding light on their feeding practices, livestock management techniques, and the broader agricultural landscape.

Keyword: Feed, feeding practices, fodder, forage, agricultural landscape

INTRODUCTION

Livestock is a vital sector in Nepal's agriculture, contributing 26% to the Agricultural GDP and 6.23% to the national GDP (MoALD, 2023). It provides essential products like meat, milk, eggs, wool, hides, and manure. The country's

livestock population includes 7.4 million cattle, 5.1 million buffalo, 0.7 million sheep, 13 million goats, 1.5 million pigs, and 66 million poultry (MoALD, 2023). Dairy farming is a significant subsector, with buffaloes contributing two-thirds of milk production and cattle contributing one-third. Of the 7.4 million cattle, only 16.49% are milking cows, and of the 5.1 million buffalo, only 32.47% are milking buffaloes. Kavre district, with 27,476 milking cows and 57,043 milking buffaloes, produces 90,758 tons of milk annually (MoALD, 2023).

Dairy farming helps farmers in many respects, such as, vital sources of cash income, sources of family nutrients, sources of manure for their agricultural land, source of biogas, and source of animal draft power. To take full advantage of dairy farming, farmers need to have access to good species of animal, extension services along with the provision of dairy infrastructure such as chilling centers, milk processing centers, and credit facilities in order to avail the necessary seed money particularly by the resource poor (Limbu, 2017). Dairy farming is an important sector in Nepal's agriculture contributing to the country's economy and providing livelihoods to many farmers. It provides employment opportunities to around 65 percent of the total population (MoALD, 2019).

Nepal's diverse ecological zones influence its livestock population. Most households own small herds of 5-7 animals. Buffaloes, especially native breeds like Lime, Parakote, and Gaddi, and the improved Murrah breed, contribute significantly to the 72% of milk and 65% of domestic meat supply (Osti, 2020). Cattle, including native breeds like Siri, Pahadi, Khaila, and Terai, and exotic breeds like Jersey and Holstein, contribute to the remaining 28% of national milk supply. Livestock production systems vary across the country. Extensive and semi-extensive systems are common in the mountains and hills, where animals graze on natural pastures and are supplemented with crop residues and forest products. In the Terai, semi-intensive and intensive systems are more prevalent, with animals often confined to stalls and fed a combination of commercial feeds, crop residues, and green fodder. Locally made semi-solid feeds, like "Kudo," which is made with kitchen waste, and maize flour mixed with rice bran are also used to supplement the diet of productive animals (Osti,2020) .

Traditionally, livestock in Nepal relied on communal grazing lands and off-farm fodder resources. However, increasing pressure on land and restricted access to communal resources have reduced the availability of these resources. As a result, farmers are increasingly reliant on lower-quality crop residues from their own farms. Seasonal feed shortages, particularly of high-quality feeds, limit livestock

holdings and productivity, especially for poorer communities with limited land and resources (Hendy *et al*., 2001).

Livestock ration primarily comprises dry fodder, cultivated green fodder, tree leaves, pastures, and grazing land depending upon the availability. In addition, conventional concentrates/compound cattle feed is supplemented in the ration especially of milk animals. More than 95% of the total concentrates used for livestock feeding are important and are the most expensive component of the ration especially protein meals/cakes. Feeds and fodders are not fed in right proportions as a result cost of production is higher, productivity is low and net profit to the livestock keepers is low (Garg & Upreti, 2019).

A balanced ration provides essential nutrients for animal growth, development, and reproduction. In Nepal, livestock primarily rely on crop residues like wheat and rice straw, maize stover, tree leaves, and green fodder. Maize, rice bran, wheat bran, and oilseed cakes are used as concentrates. However, domestic production of these concentrates is insufficient to meet the growing demand from poultry and dairy industries. As a result, Nepal imports these feeds, primarily from India. The overall feed deficit in Nepal is significant, with deficiencies of 33% in dry matter, 38% in crude protein, and 42% in metabolizable energy (Osti, 2020).

A study conducted in Chitwan, found that common grasses and fodders were Siru (*Imperata spp.*), Kans (*Saccharum spp.*), Banso (*Paspalum spp*), Maize (*Zea mays*) and Oat concentrates. Inclusion of rice straw as a major feeding resource was common in the entire land holding group and dry matter requirement was found deficit (Pant, *et al.*, 1994).

In a field study conducted by Saurav, *et al.*(2023), the information revealed that group stall feeding, common salt feeding were done by the majority of the respondents, and 79% of the dairy farmers self-cultivated the green fodder. Only 23.89% of the respondents fed mineral mixture to the lactating animals. It was observed that the dairy farmers were unaware of the importance of the concentrate mixture, balanced feeding, and proper housing management practices.

A study in Kavre (Gautam *et al.*, 2021) surveyed 122 livestock farmers. Improved housing, experienced farmers, legume-rich roughage, oilcake-supplemented concentrates, and timely veterinary care positively impacted production efficiency. Most farmers were small-scale, with an average herd size of 4.7 animals. Dairy herds consisted of 62% milking animals, 28% calves/heifers, and 10% dry animals. Maize was the primary concentrate feed, followed by rice bran,

wheat bran, soybean meal, and other oilseed cakes. Cattle and buffaloes received additional vitamins and minerals during weakness and lactation. Artificial insemination was widely used, with cattle producing an average of 1800 liters of milk per lactation over 300 days, while buffaloes produced 1300 liters per lactation over 320 days.

Another study conducted in Chitwan found that 75-80% of household in study sites raised at least 2-3 cross bred milking cows and 20% keep 1-2 buffaloes. Different green fodders, crop residues, mainly rice straw and commercial feed available throughout the year, contributed to the diet of the dairy animals. Management system adopted was complete stall fed. Herd recorded mastitis as a major disease (63.16%) followed by infertility (13.16%), milk fever (10.53%), helminths (7.89%) and remaining (abortion, poisoning, diarrhea, viral like lumpy skin disease etc.) (5.26%) (Pandey, *et al.*, 2023).

Poudel, *et al.*, (2023), carried out a study on productive and reproductive performances of two common breeds, Jersey Cross and Holstein Cross from a sample of 120 dairy herds using semi-structured questionnaire in Bharatpur Metropolitan city, Chitwan. The author found the average daily milk yield, lactation length, lactation milk yield, peak yield and dry period for Jersey Cross and Holstein Cross with the Nepalese hill cattle were 7.39±0.87 and 9.30±0.76 L./day; 303.31±8.12 and 314.18±12.75 days; 2253.39±265.28 and 2936.36±237.55 L.; 12.77±0.92 and 15.11±0.85 L. and 65.26±7.71 and 70.83±10.27 days respectively.

According to the findings of the study conducted in Myanmar, smallholder dairy farmers in Myanmar primarily use zero-grazing systems. They rely on locally available feeds like cut-and-carry grass, forage crops, crop residues, and various feedstuffs such as broken rice, rice bran, wheat bran, sorghum, yellow corn, mineral block, and oilseed cakes. While feed availability and quality vary, farmers carefully select and combine feeds to provide adequate nutrition for sustainable production. Two main feeding practices are common: compound cattle feeding and home-mixed feeding. A majority of farmers (84.77%) prefer compound feeds. Natural mating is more prevalent than artificial insemination. Milk production averages 7.45 liters per cow per day during the wet season and 6.48 liters during the dry season. Approximately 73% of farmers use concentrates based on milk production levels (Myint & Muang, 2020).

According to the study conducted in North Bihar, Group stall feeding, common salt feeding were done by the majority of the respondents, and 79 per cent of the

dairy farmers self-cultivated the green fodder. Only 23.89 per cent of the respondents fed mineral mixture to the lactating animals. It was observed that the dairy farmers were unaware of the importance of concentrate mixture, balanced feeding, and proper housing management practices (Saurav, *et al.*, 2023).

The animal in Nepal are under fed with 36 percent feed deficient, mainly during winter in the country. In the context of available Total Digestible Nutrient (TDN) 29 percent is deficient (NAFLQML, 2019). There have been a significant change (build up area (65.5%) in land use pattern in Nepal over 2 decades (1990-2010), (Garg & Upreti, 2019).

Challenges in the dairy sector

Nepal's dairy farmers face significant challenges, including feed quality, quantity, pricing, storage, and water scarcity. High feed costs, accounting for 70% of production expenses, particularly burden small-scale farmers. Limited grazing and fodder availability during dry seasons exacerbate the issue. Researchers are exploring ways to improve feed utilization, especially crop residues, to increase milk production and profitability. Key bottlenecks to the dairy sector's growth include low cattle productivity, limited market access, unscientific pricing, and lack of product diversification (Sigdel, 2016).

Dairy farmers in the region face numerous challenges, as highlighted by Khanal (2015). The degradation of forests and land has led to severe feed shortages. Inadequate government support, including limited veterinary services, breeding programs, and advisory services, further hampers the sector. High opportunity costs for land and labor, coupled with labor migration, exacerbate the situation. Poor infrastructure and limited market access restrict growth, while rising input costs and unregulated milk prices pose significant financial burdens on farmers (Khanal, 2015).

Livestock, the dairy sector in particular, has traditionally contributed to the Nepalese economy and livelihoods even though vegetarian centered food habits predominate. However, the sector has not seen significant improvement. The International Livestock Research Institute's (ILRI) FEAST(Feed Assessment Tool) has been used to assess feeding systems in Kapilvastu, Palpa, and Arghakhanchi districts. Youth migration has reduced agricultural land, and the lack of fodder crops limits feed availability, hindering commercial dairy growth. Other challenges include labor shortages, competition with rice cultivation, indigenous breeds, and policy barriers like credit constraints and inadequate government support. To achieve self-sufficiency in milk and dairy products by

2020, a dairy-focused program is needed to utilize land and resources and commercialize the sector (Paudel et al., 2019).

The overall objective of the study is to assess the feed and feeding practices in dairy cattle in Kavre district with a focus on identifying current practices, identifying challenges and opportunities for improvement, in providing adequate nutrition to dairy cattle. This study has several limitations. Firstly, the study was conducted over a relatively short duration, which may limit the ability to capture long-term trends in feed and feeding practices. Secondly, the sample size was small, which may affect the generalizability of the findings to the entire population of dairy farms in the region. Thirdly, since a survey method was employed for data collection, there is a potential for recall bias, as respondents provided information based on their memory and estimation. Lastly, the dairy farms in the study area exhibit significant heterogeneity in terms of size, management practices, and available resources, making it challenging to generalize the data across all farms.

MATERIALS AND METHODS

Study area

The present study was conducted in different wards of Panchkhal Municipality of Kavrepalanchowk district. The traditional main occupations in this area are farming, animal husbandry, and trading (Anon, 2022). A descriptive study was carried out on feed and feeding practices of dairy animals in ward no. 3, 4 and 10 of Panchkhal municipality of Kavrepalanchowk district as shown in Figure 1.

Study population

Altogether 42 small- scale dairy farmers situated within the study sites were visited, each of whom maintained a minimum of one dairy animal.

Data collection

Snowball sampling technique was used to gather primary data using a pre-designed questionnaire, through face-to-face interviews and personal observations conducted on each farm. The structured questionnaires were administered to the dairy farmers to gather data on farm demographics, feeding practices, types of feed used, and the challenges encountered in ensuring adequate nutrition for their animals.

Secondary data on recent studies, animal population, and current situations were gathered from a variety of sources, including research papers, newspaper, journals, and articles, among others.

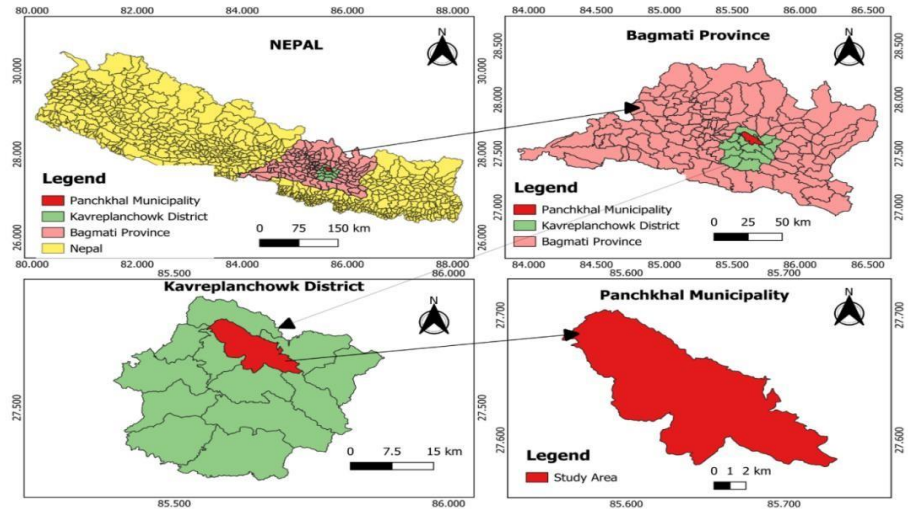


Figure 1. Map showing study area (using QGIS)

Study population

Altogether 42 small- scale dairy farmers situated within the study sites were visited, each of whom maintained a minimum of one dairy animal.

Data collection

Snowball sampling technique was used to gather primary data using a pre-designed questionnaire, through face-to-face interviews and personal observations conducted on each farm. The structured questionnaires were administered to the dairy farmers to gather data on farm demographics, feeding practices, types of feed used, and the challenges encountered in ensuring adequate nutrition for their animals. Secondary data on recent studies, animal population, and current situations were gathered from a variety of sources, including research papers, newspaper, journals, and articles, among others.

Data analysis

The primary data collected were coded, tabulated and analyzed using descriptive statistics using Microsoft Excel.

RESULTS AND DISCUSSION

General observations

The predominant production method adopted by dairy farmers in the study area was found to be zero grazing. Management system adopted was complete stall fed. Most of the dairy farmers with land grow their own grass and maize stovers

to feed their animals and those that don't have land source forage from various locations, including communal grazing lands, roadsides, and riverbanks. In the dry season when forages are scarce, dairy farmers give feeds such as rice straw (*Oryza sativa*), corn husks (*Zea mays)*, grass hay and silage.

Livestock system

Livestock in the study sites served primarily as a means of generating income and providing manure for use in agricultural fields. Among the livestock species kept by households for milk production, cross-bred Jersey cows are the predominant choice, with approximately 79% of households owning them. A smaller percentage, 8%, raises Holstein Friesian cross cattle, while 3% keep Holstein Friesian cattle, and 10% opt for local cattle breed respectively (Figure 2).

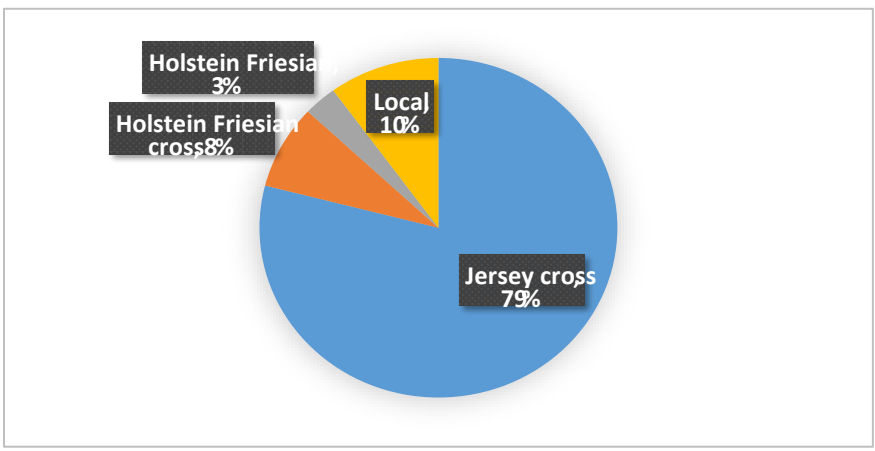
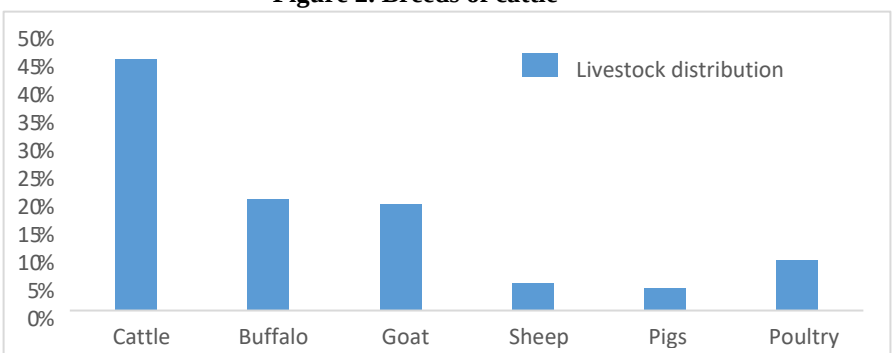


Figure 2. Breeds of cattle



.

Figure 3. Livestock distribution in the study area

Additionally, 20% of households keep buffalo, predominantly the Murrah Buffalo, for milking purposes. Around 19% of households raised goats for eventual sale as meat, while only 5%, 4%, and 9% of households raised sheep, pigs, and poultry, respectively, primarily for household consumption (Figure 3). This study findings underscored the significant role of large ruminants, particularly cross-bred Jersey cows, as a major source of income within the study site.

Feed resources

In the study area, farmers feed their dairy animals with crop residues like rice straw, wheat straw, maize straw, and legumes. Rice straw is the most common, followed by maize fodder. They also use hulls from different crops as a significant food source. Additionally, farmers collect green resources from forests and use grasses and legumes from cultivated lands. Some farmers grow specific grasses like Napier (*Pennisetum purpureum)*, Fodder oat (*Avena sativa*), Stylo (*Stylosanthes guianensis*), and Teosinte (*Zea diploperennis*). Seasonal green grasses are Siru (*Imperata spp*.), Kans (*Saccharum spp*.), and Banso (*Paspalum spp*.), among others. Maize flour is the preferred concentrate, followed by rice and its by-products, along with oilseed cakes and meals. Lactating animals are given thyme seeds and molasses for their nutritional needs (Figure 4).

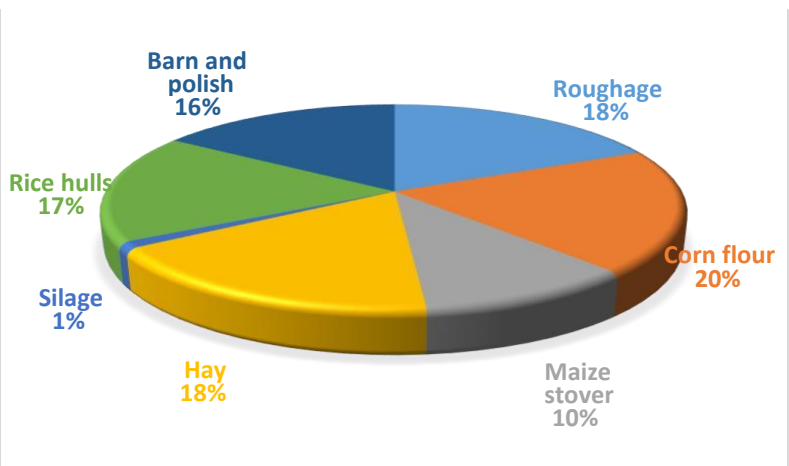


Figure 4. Dietary overview of the animals in the study area

Farmers mostly keep their animals in confined spaces (zero grazing) and use a tie-stall feeding system. About 49% of them make their own animal food, while 49%

combine homemade mixtures with compounded cattle feed. Only 2% prefer using solely compounded cattle feed. Most farmers feed their animals twice a day (76%), with 24% feeding three or more times a day. Traditional methods are common, with 93% preparing a mixture called "kudo" by cooking concentrates with water, and 7% giving concentrates directly without processing.

Regarding fodder, 51% of farmers grow their own, with Napier grass being the most popular choice. About 49% feed hay, 15% feed maize stover, and 36% use both as dry fodder. Supplements like molasses (12%), calcium (15%), and thyme seeds (9%) are provided, mainly during lactation or when needed (Table 1).

Table 1. Feeding practices of dairy animals followed by dairy farmers

S.N.	Feeding Practices	Percentage
1	**Feeding system**	
a.	Zero grazing	100%
b.	Grazing	0
2	**Frequency of feeding (concentrates)**	
a.	Twice	76%
b.	Thrice or more	24%
3	**Type of concentrate**	
a.	Homemade mixture	49%
b.	Compound cattle feed	2%
c.	Both	49%
4	**Method of feeding concentrate**	
a.	Kudo	93%
b.	No	7%
5	**Fodder cultivated**	
a.	Yes	51%
b.	No	49%
6	**Cultivated fodder**	
a.	Napier	51%
b.	Fodder oats	22%
c.	others	17%
7	**Dry fodder mostly fed**	
a.	Hay	49%
b.	Maize stover	15%
c.	Both	36%
8	**Supplements**	
a.	Molasses	12
b.	Calcium	15%
c.	Thyme seeds	9%

Breeding technique adopted in the study site

In the study site, 80.49% respondents preferred artificial insemination and 19.51% preferred natural method of breeding technique (Table 2). Natural mating methods face limitations such as the absence of male bulls in nearby areas and concerns about disease transmission, prompting farmers to opt for AI as a more practical and efficient alternative.

Table 2. Breeding technique

S.N	Breeding method	Percentage
1.	A.I.	80.49
2.	Natural mating	19.51

Milk yield (liter/day/cow) of lactating cows as reported by the respondents

In the study area, the average daily milk production per cow is 10.26 liters, with the lowest being 4 liters and the highest being 16 liters. Most of this milk is either sold to nearby dairies or used by the households. However, it's important to note that the price of milk can vary a lot in the local dairy market. On average, milk is sold for about Rs. 16.73 for every 1 percent of fat in the milk, as the price depends on how much fat the milk has.

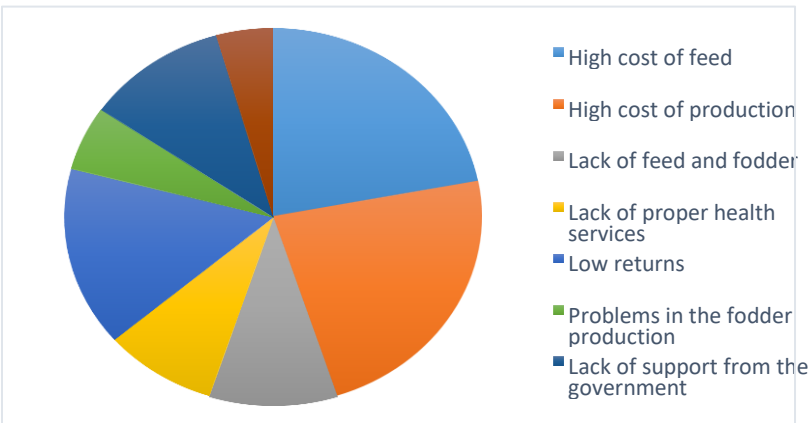


Figure 5. Problems faced by the dairy farmers in the study area

Problems

On the basis of answers given by the respondents, one of the major problems in the dairy animals is high cost of production (51.2%) followed by high cost of feed (48.8%), low return (34.1%), lack of feed and fodders (22%), lack of health services (19.5%), lack of support from the government (24.4%). Problems in the

fodder production (12.2%) and 9.8% find there are no problems in providing the feeds in the dairy animals (Figure 5).

Health situation

The study result revealed that the most prevailing disease in the study site were mastitis (41 %) followed by milk fever (15%), repeat breeding (17 %), parasitic infection (6 %) and others (toxicity, allergy, pneumonia) (9%) (Figure 6)

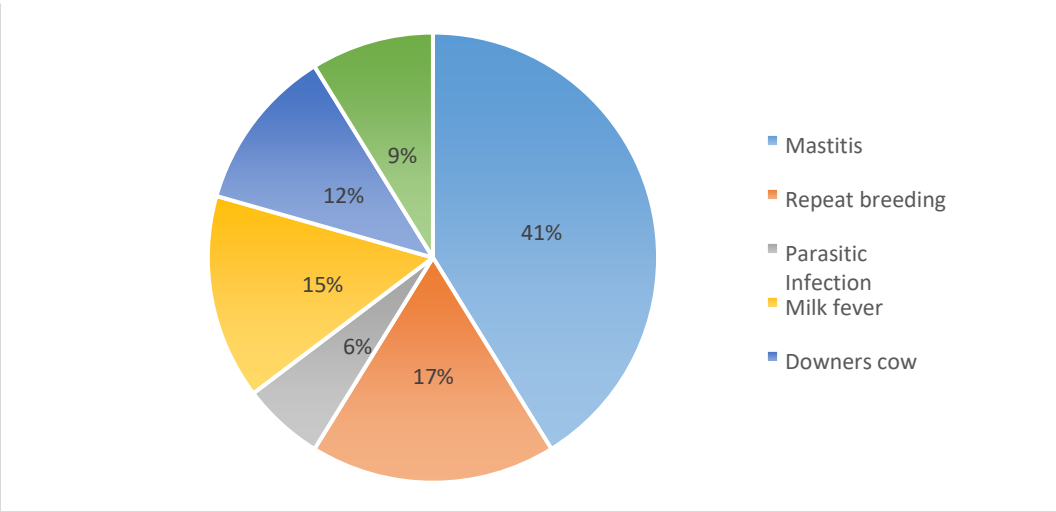


Figure 6. Health situation in the study site

Discussion

The study on feeds and feeding practices of dairy cattle in small-scale farms of Kavre district, Nepal, provides valuable insights into the current practices, challenges, and opportunities for improvement. The study found that zero grazing is the predominant farming method among dairy farmers in the area. This is likely due to the limited land availability and the need to protect crops from grazing animals. Additionally, zero grazing allows for more efficient feed management and waste disposal. However, this practice can also lead to nutrient imbalances and inefficient feed utilization, as evidenced by the high reliance on costly concentrates and imbalanced supplementary feeds in the study area.

The majority of dairy animals raised are cross-bred cattle, primarily Jersey cross. This is likely due to the superior milk production potential of cross-bred cattle. However, it is important to note that cross-bred cattle can be more susceptible to diseases and require more intensive management. Dairy farmers primarily utilize locally available feed resources such as crop residues, fodder tree leaves, and

grass from fields and forests. This is likely due to the high cost of commercial feed and the limited availability of credit. However, it is important to note that locally available feed resources can be variable in quality and quantity, which can impact animal performance.

The traditional feeding method of "kudo" is also a common practice in Nepal. This method involves mixing all available feed resources with water and feeding the mixture to the animals. While this method is simple and convenient, it can lead to nutrient imbalances and inefficient feed utilization.

The average milk yield per day of 10.26 liters in the study area is relatively low compared to the genetic potential of cross-bred cattle. This is likely due to a number of factors, including inadequate nutrition, poor management practices, and disease. The major challenges faced by dairy farmers in the study area, including high cost of feed, low milk yields, limited access to markets, inadequate nutrition, poor management practices, and disease, are also consistent with the findings of previous studies. These challenges are likely contributing to the low milk yield and profitability of dairy farms in the area.

These findings are in accordance to the findings of Gautam, *et al.* (2021) that showed small scale farmers at Kavre district mostly practice mixed traditional farming system and tie-stall feeding system with complete integration of crops, livestock and forest resources. In concentrate, maize was the main feed ingredient followed by rice bran, wheat bran, soybean meals, mustard cake, sunflower cake and other legumes byproducts. Vitamins and minerals were provided when the cattle and buffaloes were weak and during milking stage. AI breeding method was highly used then natural breeding method in study areas.

The results align with similar studies conducted in Myanmar and India by Saurav *et al.* (2023) and Myint & Muang (2020) respectively. Saurav *et al.* found that in India, the majority practiced group stall feeding and self-cultivated green fodder, with only 23.89% providing mineral mixture to lactating animals. In Myanmar, Myint & Muang noted widespread zero grazing among smallholder farmers, utilizing local resources like cut and carry grass, crop residues, and various feedstuffs.

Crop residue i.e. hay/straw is the major dry fodder provided to the dairy animals mainly in the winter season. This finding was in line with the findings of Sah, he found that Crop residue i.e. straw contributes almost 50% of total DM supplied to the animal in all the districts which was low in nutrient content. The feeding of

concentrates was not practiced in required amount because livestock are traditionally reared in all the districts (Sah, *et al.*, 2018).

This study gives us important information about milk production, showing that cow produces an average of 10.26 liters per day. However, the prices of milk in the market can change a lot, and this tells us that we need to have fixed prices and make sure farmers get fair pay. There are other studies by Upadhyaya *et al.* (2018), which found an average daily milk yield of 9.24±0.21 liters per cow in Chitwan, and by Poudel *et al.*, (2023), which documented an average of 8.26 liters. The higher average milk production in our study area could be because we looked at a smaller group of cows, and there are more crossbred dairy animals in our area.

Our study's data aligns with research conducted in Chitwan by Pandey, *et al.*,2023, indicating that the most prevalent diseases in the study site were mastitis (63.16%), followed by infertility (13.16%), milk fever (10.53%), helminths (7.89%), and other conditions such as abortion, poisoning, diarrhea, and viral diseases like lumpy skin disease (5.26%). These findings are consistent with our research results.

Dairy farmers encounter a myriad of challenges that encompass high production costs, costly feed, diminished returns, insufficient government assistance, and limitations in healthcare services, all of which present substantial obstacles. Furthermore, the intricate interaction of factors including land scarcity, labor migration, and difficulties in accessing markets compounds these challenges. Interestingly, these findings are consistent with those reported by Paudel, *et al.*, (2019) and also with (Khanal, 2015).

CONCLUSION

The study on feeds and feeding practices of dairy animals in small scale farms in Kavre district, Nepal, provides valuable insights into the intricate challenges faced by regional dairy farmers. The findings highlight the need for interventions to improve feed management and promote sustainable dairy production practices. . The prevalence of zero grazing, coupled with the complex balance of crop residues and supplementary feeds, underscores the multifaceted nature of dairy farming in this region. The variability in milk prices based on fat percentage underscores the urgency of implementing standardized pricing mechanisms to ensure fair returns for farmers.

RECOMMENDATIONS

The key recommendations of the study are as follows:

- Promote the cultivation of forage crops to provide a nutritious and cost-effective feed source for dairy animals.
- Raise awareness of balanced feeding practices and the importance of using quality feed ingredients.
- Provide subsidies for inputs such as seeds and fertilizers, and promote access to technical knowledge and extension services.
- The government should develop policies and programs to support dairy farmers, such as providing access to credit and markets
- The government should standardize the pricing mechanism to ensure fair returns to the farmers

REFERENCES

Anon, (2022) *Panchkhal Municipality "Panchkhal Municipal Agriculture City"*.. [Online] Available at: https://panchkhalmun.gov.np/en [Accessed 14 September 2023].

Garg, M. & Upreti, C. R. (2019) *Assessment of Feed Resources, Feeding Practices, Nutritional Status, and Future Strategies for Improving Productive and Reproductive Efficiency of Dairy Animals including Standard Operation Procedure(Sop) of Nepal,*.: National Livestock Sector Innovation Project.

Gautam, S., Neupane, N., Dhital, B. & Neupane, H. B. S. (2021) Status of cattle and buffalo farming in Banepa, Panchkal, Panauti of Kavrepalanchowk district, Nepal.. *Journal of Livestock Science,* Vol. 2: 125-131.

Hendy, C. et al., (2001) *Seasonal patterns of livestock feed collection and deficits for small holder mixed farms in the mid-hills zone of Nepal.*

Khanal, K. (2015) *Situation of Milk Production in Nepal.* [Online] Available at: https://kapilkhanal46.wordpress.com/2015/06/11/situation-ofmilk-production-in-nepal/ [Accessed 19 august 2023].

Limbu, R. P. (2017) *Role of Dairy Farming in Rural Development: A Case Study of Janahit Milk Producer Cooperative, Malpokhari VDC, Illam District, Nepal,*

MoALD. (2019) *Statistical information on Nepalese Agriculture, 2076/77 (2019/20).* [Online] Available at: https://moald.gov.np/wp-content/uploads/2022/04/ [Accessed 25 August 2023].

MoALD. (2023) *Statistical Information on Nepalese Agriculture 2078/79(2021/22).* [Online] Available at: https://moald.gov.np/wp-content/uploads/2023/08/ [Accessed 4 September 2023].

Myint, A. A. & Muang, E. E. W. (2020) Feeds and Feeding Practices for Dairy Cattle Farming in selected areas of Myanmar. *International Journal of Environment and Rural Development,* 11(1): 69-74.

NAFLQML. (2019) *Balance Sheet of Animal Feed and Forage Seed of Nepal and Impact Study of Forage Mission Program Pub Nation Animal Feed and Livestock Quality Management Laboratory (NAFLQML),* Harihar Bhawan, Lalitpur.

Neupane, G. (2019) Livestock Feeds and Feeding Practices in Nepal. In: A. K. Samanta, S. M. Bokhtiar & M. Y. Ali, (eds.) *Livestock Feeds and Feeding Practices in South Asia*. SAARC Agriculture Centre, Bangladesh, Dhaka, pp. 101-128.

Osti, N. P. (2020) Animal Feed Resources and their Management in Nepal. *ACTA Scientific Agriculture (ASAG)*, January, 4(1): 02-14.

Pandey, S. k., Chaulagain, R., Khadka, A. & Balami, B. (2023) High Corn Silage Diets in Plastic Packaging: A Way-out Solution in Fodder Scarcity. *Nepalese Journal of Agricultural Sciences*, July, 25(17): 197-214.

Pant, S., Joshi, N. & Gajurel, K. (1994) Feeding practice for lactating buffaloes in Sharad Nagar village, Chitwan.. *Journal of Institute of Agriculture and Animal Science*, pp. 116-126.

Paudel, T. P., Pokharel, B. R. & Shrestha, B. S. (2019) Assessment of the Dairy Animal Feeding System of Western Nepal: A Synthesis of Focus Group Discussion.

SAARC Journal of Agriculture, 12, 17(2): 253-266.

Poudel, S., Chhetri, D. & Barsila, S. R. (2023) Productive and Reproductive Performance of Farmers Managed Dairy Cattle in Western Chitwan, Nepal. *Journal of the Institute of Agriculture and Animal Science*, August , Volume 37, pp. 160-172.

Sah, B., N.R, D. & Chaudhari, R. (2018) Situation analysis of dry matter availability and its consequences during winter season to the buffalo in relation to climate change: Evidence from Gandaki river basin, Nepal. *Nepalese Journal of Agricultural Sciences*, Volume 16, pp. 67-77.

Saurav, S. K. Chakravarty, R, Yadav, P., Pandey, S., Mishra, S., & Chandran, V. (2023) Feeding and Housing Management Practices of Dairy Animals Followed by Dairy farmers of North Bihar. *Biological Forum - An International Journal*, 06 January, 15(1), pp. 69-74.

Sigdel, A. (2016) *Nepal Animal Source Foods Production and Marketing Brief*.: Feed the future innovation lab for livestock systems, USAID.

Upadhyaya, S., Devkota, L., Sapkota, B. & Bhattarai, N. (2018) Assessment of existing milk production, consumption and marketing patterns for milk produced by dairy cattle in Chitwan, Nepal. *Agriculture and Forestry University*.