

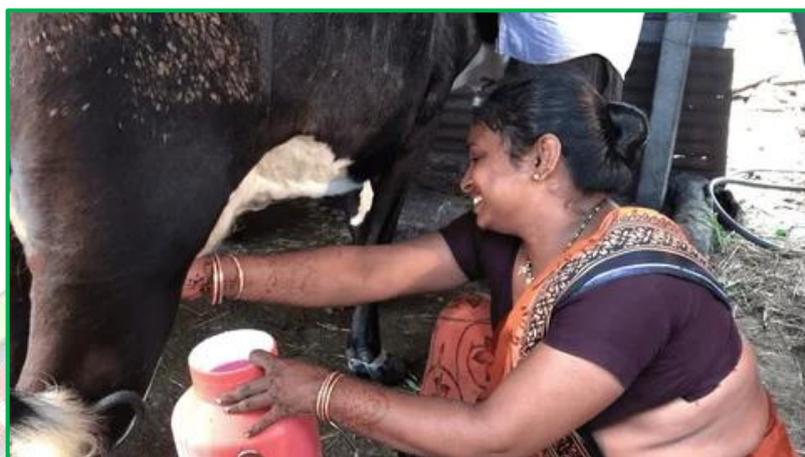
Lactating Cow Management in the Tarai Region

*Anirudh Chandra, Saksham Rajput and Rupendra Nayal

College of Veterinary and Animal Sciences, GBPUAT, Pantnagar, Uttarakhand, India

*Corresponding Author's email: chandra.anirudh@yahoo.com

Dairy farming in the Tarai region plays a crucial role in supporting rural livelihoods and meeting the growing demand for milk. However, the region's unique agro-climatic conditions—characterized by high humidity, heavy rainfall, hot summers, and cold winters—pose significant challenges to the management of



lactating cows. These environmental stressors directly influence milk yield, udder health, feed efficiency, and overall animal well-being. This article explores the key aspects of lactating cow management in the Tarai region, drawing upon recent research findings and field-based studies. It discusses climate-related challenges and highlights the importance of scientific housing, balanced feeding strategies, clean water access, mineral supplementation, and seasonal health care. Special emphasis is placed on heat stress management during summer, disease prevention during monsoon, and hygienic milking practices to reduce mastitis and improve milk quality. By integrating research-backed recommendations with practical farm-level insights, the article aims to provide dairy farmers, students, and extension workers with a comprehensive understanding of how climate-responsive and scientifically informed management practices can enhance milk production, improve animal health, and promote sustainable dairy development in the Tarai region.

Introduction: Dairy Farming in the Tarai Region

The Tarai region, located at the foothills of the Himalayas in states like Uttarakhand and Uttar Pradesh, is known for its fertile soil, abundant groundwater, and high agricultural productivity. However, it also experiences **high humidity, heavy monsoon rainfall, and warm summers**. These climatic conditions directly influence dairy farming practices. High humidity and prolonged wet seasons can create stressful conditions for lactating cows. Moist environments increase the risk of mastitis, parasitic infestations, and hoof problems. Therefore, dairy farmers in the Tarai region must adopt management practices that are climate-sensitive. Good ventilation, dry housing, and seasonal adjustments in feeding and health care are essential to maintain milk productivity throughout the year. Understanding the environment is the first step in managing lactating cows effectively in this region.

Understanding the Tarai Climate and Its Challenges

The Tarai region experiences high humidity, intense summer heat, heavy monsoon rainfall, and cold, foggy winters. These fluctuating climatic conditions directly influence the performance of lactating cows. During summer (**April–June**), temperatures generally range between **30°C to 42°C**, often accompanied by high humidity, leading to heat stress and reduced feed intake. Animals may pant excessively, stand for longer periods, and consume more water while eating less. In the **monsoon season (July–September)**, temperatures usually range from **25°C to 35°C**, continuous moisture creates muddy surroundings, leading to bacterial growth and higher chances of mastitis and hoof problems. During **winter (December–February)**, temperatures may fall between **5°C to 20°C**, sometimes lower during cold waves, increasing the animals' energy requirements to maintain body temperature. Due to these seasonal variations, dairy management in the Tarai region cannot remain the same throughout the year. **Green fodder that is quickly digested and high in moisture is the best option in the summer** to minimize heat stress and preserve milk production. During the **monsoon**, special care must be taken to provide clean and fresh fodder such as **maize, sorghum, cowpea, and hybrid napier**, along with properly stored dry fodder and balanced concentrate mixtures, while strictly avoiding moldy or waterlogged feed to prevent digestive disorders and infections. To meet their higher maintenance needs, animals need more energy-rich diet during the **winter, such as grains, oilseed cakes, and high-quality dry hay or silage.**

During the monsoon season in the Tarai region, high humidity and continuous rainfall create favorable conditions for bacterial growth and parasite multiplication. Lactating cows are particularly vulnerable, making strict hygiene practices essential. The udder should be properly cleaned and dried before milking, and pre- and post-milking teat dipping should be practiced to reduce the risk of mastitis. Clean hands, sanitized equipment, and dry bedding further help maintain milk quality and udder health. Monsoon also increases the prevalence of internal parasites such as **strongyle** and **tick-borne** protozoan infections like **babesiosis** and **theileriosis**. These conditions may lead to anemia, weakness, fever, reduced feed intake, and decline in milk yield. Strategic deworming, regular tick control, proper shed drainage, and prevention of water stagnation are important measures to minimize disease risk and maintain herd productivity during the rainy season.

Housing Management in Humid Conditions

Housing management is essential to preserving the well-being and output of nursing cows in the Tarai region. The monsoon season brings significant rainfall and a humid temperature, which can quickly make poorly built sheds unsanitary and moist. A cow rests for a significant amount of the day, and a damp or unclean resting place has a direct impact on the comfort, health, and milk output of the udder. Simple housing concerns like poor drainage, low-lying floors, or insufficient ventilation are often the root cause of productivity challenges. Water buildup within or near the shed produces muddy conditions that encourage the growth of microorganisms. Many productivity problems begin with simple housing issues such as improper drainage, low-lying floors, or inadequate ventilation. When water accumulates inside or around the shed, it creates muddy conditions that promote bacterial growth. This increases the risk of mastitis, hoof infections, and parasitic infestations. Lactating cows kept in uncomfortable housing may also experience stress, reduced feed intake, and lower milk yield. **Proper housing in the Tarai region should focus on dryness and airflow. A slightly raised and sloped floor allows urine and rainwater to drain away easily.** Good ventilation can be ensured by designing sheds with **open sidewalls or large mesh-covered windows** that allow continuous cross-ventilation. A **high roof** with a ridge opening at the top helps hot and moist air escape naturally, while adequate roof height improves overall air circulation. In highly humid conditions, the use of **ceiling or exhaust fans** can further support airflow. Such simple ventilation measures help keep the shed dry and comfortable, reduce heat stress, and minimize the risk of respiratory problems and mastitis, thereby supporting better milk

production. **Dry and clean bedding** makes cows more comfortable and helps them to lie down and ruminate correctly, which enhances milk output and digestion. Throughout the lactation phase, cows naturally produce more and stay healthier when they feel safe, clean, and stress-free.

Feeding Strategies for High Milk Production

Feeding is the backbone of lactation management. A lactating cow converts feed into milk, and the quality and quantity of feed determine how efficiently this conversion takes place. In the Tarai region, fodder availability is generally good due to fertile land, but feeding practices are not always balanced according to the cow's production level. Lactation places enormous nutritional demands on the animal, especially during early lactation when milk yield peaks. If energy and protein requirements are not met, the cow begins to use her body reserves, leading to weight loss, reduced immunity, and decreased milk production. Over time, this weakens the animal and causes for **reproductive issues**. Fodder management plays a crucial role in maintaining both milk production and reproductive health. A balanced ration should include adequate quantities of green fodder, dry roughage, and concentrate feed according to the stage of lactation. In **early lactation**, a cow may be provided about **15–20 kg of green fodder** (such as maize or sorghum), **4–6 kg of dry roughage** (wheat straw), and **1 kg of concentrate per 2–2.5 liters of milk produced**, along with mineral mixture, to prevent negative energy balance and support timely return to estrus. During **mid-lactation**, around **15 kg green fodder**, **5–6 kg dry fodder**, and a balanced quantity of concentrate help maintain milk yield and body condition. In **late lactation and the dry period**, feeding can include **10–12 kg green fodder**, **5–6 kg dry roughage**, and limited concentrates (about **1–2 kg per day**) with mineral supplementation to support fetal growth and prepare the cow for the next calving. Providing appropriate feed quantity at each stage improves fertility, conception rate, and overall reproductive efficiency.

Stage-Wise Fodder Management in Dairy Cows

Stage of Lactation	Green Fodder (kg/day)	Dry Roughage (kg/day)	Concentrate Feed	Mineral Supplementation	Purpose
Early Lactation	5–20 kg (maize, sorghum)	4–6 kg (wheat straw)	1 kg per 2–2.5 liters of milk produced	50–60 g/day mineral mixture	Prevent negative energy balance, support early return to estrus
Mid-Lactation	15 kg (berseem, hybrid napier, maize)	5–6 kg (wheat straw, paddy straw, hay)	Balanced quantity based on milk yield	50–60 g/day	Maintain milk yield and body condition
Late Lactation / Dry Period	10–12 kg maize fodder, sorghum, oat fodder, cowpea)	5–6 kg (wheat straw, paddy straw, hay)	1–2 kg/day (limited)	50–60 g/day	Support fetal growth and prepare for next calving

Importance of Clean Water and Mineral Supplementation

Clean and sufficient drinking water is essential for lactating cows, as milk contains nearly 85–87% water. A dairy cow should receive **60–80 liters of clean water per day**, and high-yielding animals may require up to **100 liters daily**, especially during summer. Water should

always be fresh, free from contamination, and available at all times, as even short periods of water restriction can reduce milk yield and affect reproductive performance.

Mineral supplementation is equally important for maintaining bone strength, milk production, immunity, and fertility. A **balanced mineral mixture** should be provided at the rate of **50–60 grams per cow per day**, mixed with concentrate feed. This is especially important during **early lactation, late pregnancy, and breeding periods**, when mineral demand is high. Common deficiencies of calcium, phosphorus, and trace minerals can lead to problems such as milk fever, silent heat, repeat breeding, and weak calves. In addition, **common salt (sodium chloride)** should be supplied daily at about **30–40 grams per cow**, either mixed in feed or provided as a salt lick block in the shed. Salt improves appetite, maintains electrolyte balance, and supports overall metabolic function.

Thus, continuous access to clean water along with proper mineral and salt supplementation is essential for sustaining milk production, reproductive efficiency, and overall herd health.

Managing Heat Stress During Summer

Summers in the Tarai region can be extremely stressful for lactating cows, with temperatures often reaching **40–45°C** along with high humidity. Since the normal body temperature of a cow is **38.5–39.5°C**, even a slight rise can cause heat stress. Due to their poor sweating ability, cows struggle to regulate body temperature, leading to reduced feed intake, increased water consumption, rapid breathing, and diversion of energy away from milk production. As a result, milk yield declines, immunity weakens, and fertility may be affected. Prolonged heat exposure can cause long-term productivity losses.

Managing heat stress requires practical measures such as providing adequate shade, proper ventilation, and good air circulation to reduce heat buildup in sheds. The use of fans or sprinklers further improves cooling. Feeding during cooler hours (early morning and late evening) helps maintain intake, and unlimited access to clean drinking water is essential to prevent dehydration and support temperature regulation. These measures help maintain milk yield and animal comfort during peak summer conditions.

Milking Hygiene and Mastitis Prevention

Mastitis is one of the most prevalent diseases in dairy cattle, affecting approximately **40–60% of cows in India** at some stage of lactation. The majority of cases (about **70–80%**) are subclinical, meaning they show no visible signs but still cause reduced milk yield and economic loss, while clinical cases are fewer but more apparent. In high-producing herds with poor hygiene management, prevalence can exceed **50%**. The disease is found more frequently during **humid and rainy weather**, particularly in the **monsoon season**, due to high humidity, muddy floors, wet bedding, and rapid bacterial multiplication. Cases also increase during **hot and humid summers** because heat stress lowers immunity and cows remain in moist, contaminated environments. In contrast, **cold and dry winters** generally show lower prevalence unless housing conditions are damp and poorly ventilated.

It is an inflammation of the mammary gland primarily caused by the entry and multiplication of pathogenic microorganisms through the teat canal, leading to tissue damage, altered milk composition, reduced yield, and economic loss. It commonly develops when proper milking hygiene is not maintained, especially under humid and muddy conditions such as those seen during the monsoon in the Tarai region. Preventive milking hygiene includes washing the udder with **clean water, using a mild disinfectant solution, drying teats** properly before milking, maintaining clean hands and equipment, and ensuring dry bedding. A dilute solution of potassium permanganate (**KMnO₄**), usually prepared as a light pink solution (**around 0.01%**), is sometimes used for washing teats before milking because of its oxidizing and antimicrobial properties; however, it must be used carefully to avoid skin irritation and should always be followed by proper drying.

Seasonal Health Care and Vaccination Practices

S. No.	Disease	Age at First Vaccination	Booster Dose	Revaccination / Frequency	Remarks / Best Time
1.	Foot-and-mouth disease (FMD)	4 months	After 1 month (if first time)	Every 6 months	Mass vaccination under national program
2.	Hemorrhagic septicemia (HS)	6 months	–	Once yearly	Before monsoon (April–June)
3.	Black quarter (BQ)	6 months	–	Once yearly	Before monsoon
4.	Brucellosis	Female calves 4–8 months	No booster	Single lifetime dose	S19/RB51 vaccine; only female calves
5.	Theileriosis	Above 3 months	–	Usually single dose (as advised)	In endemic areas
6.	Anthrax	Above 6 months	–	Once yearly	In endemic areas only
7.	Lumpy skin disease (LSD)	Above 4 months	As per advisory	Annual (depending on outbreak)	Government program areas
8.	Rabies	After 3 months (if exposed/high risk)	As per protocol	Annual in high-risk areas	Post-bite vaccination mandatory
9.	Infectious bovine rhinotracheitis (IBR)	3–6 months	After 1 month	Annual	In organized farms/breeding herds
10.	Bovine viral diarrhea (BVD)	3–6 months	After 1 month	Annual	Large commercial herds
11.	Leptospirosis	Above 4 months	After 4 weeks	Annual	High rainfall areas

Conclusion

The Tarai region has strong potential for dairy development due to its fertile land and abundant fodder resources, but its high humidity, heavy rainfall, and seasonal temperature changes demand careful management of lactating cows. Clean, well-ventilated housing, proper drainage, dry bedding, balanced nutrition, and adequate water are essential to sustain productivity. Since mastitis remains highly prevalent (around 40–60% in many Indian herds), especially during humid and rainy seasons, strict milking hygiene, proper teat sanitation (including safe use of dilute KMnO₄ where practiced), and regular monitoring are crucial. A structured seasonal health program with timely vaccination (FMD, HS, BQ, Brucellosis in female calves, LSD, and other region-specific diseases) along with strategic deworming before and after monsoon further reduces disease burden. Avoiding indiscriminate oxytocin use and ensuring veterinary guidance strengthen long-term herd health. Ultimately, combining scientific management with practical field application ensures sustainable productivity, improved milk quality, and better livelihoods for dairy farmers in the Tarai region.

References

1. Dahl, G. E., & Tao, S. (2020). Heat stress effects during late gestation on dry cows and their calves. *Journal of Dairy Science*, 103(6), 5585–5593.
2. Polsky, L., & von Keyserlingk, M. A. G. (2017). Invited review: Effects of heat stress on dairy cattle welfare. *Journal of Dairy Science*, 100(11), 8645–8657.
3. Gantner, V., Bobić, T., Gantner, R., et al. (2017). Differences in response to heat stress due to production level and breed of dairy cows. *International Journal of Biometeorology*, 61, 1675–1685.
4. West, J. W. (2019). Effects of heat stress on production in dairy cattle. *Journal of Dairy Science*, 86(6), 2131–2144.
5. FAO & IDF. (2019). *The global standard for quality raw milk*. Food and Agriculture Organization of the United Nations.
6. Ruegg, P. L. (2017). A 100-year review: Mastitis detection, management, and prevention. *Journal of Dairy Science*, 100(12), 10381–10397.
7. Ohnstad, I., Mein, G., & Hillerton, J. (2020). Best practice milking management. *Livestock Science*, 241, 104247.
8. FAO. (2018). *Dairy development's impact on poverty reduction*. Food and Agriculture Organization of the United Nations.
9. Kumar, N., Manimaran, A., Kumaresan, A., et al. (2017). Mastitis effects on reproductive performance in dairy cattle. *Theriogenology*, 91, 1–7.
10. Laven, R., & Peters, A. (2018). Bovine mastitis and its relationship to milk production and fertility. *Veterinary Journal*, 238, 8–15.
11. Singh, M., et al. (2018). Oxytocin use in dairy animals: Implications for animal and human health. *Indian Journal of Animal Sciences*, 88(4), 380–385.
12. Food Safety and Standards Authority of India (FSSAI). (2018). Advisory on misuse of oxytocin in dairy animals. Government of India.
13. National Dairy Development Board (NDDB). (2020). *Scientific dairy farming practices manual*. NDDB, India.
14. Thornton, P. K. (2019). Livestock production: Recent trends and future prospects. *Philosophical Transactions of the Royal Society B*, 365(1554), 2853–2867.
15. IPCC. (2022). *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Intergovernmental Panel on Climate Change.
16. Chand, N., Kumar, S., Soni, Y. K., Pande, M., Prasad, N., & Saha, S. (2019). *Prevalence, diagnosis and management of mastitis in dairy cattle under field conditions*. *Indian Farming*, 69(6). Detailed discussion on mastitis prevalence and management in Indian herds.
17. Krishnamoorthy, P. et al. (2013). *A systematic review and meta-analysis of subclinical mastitis in dairy cows in India*. *PubMed*. Reporting pooled prevalence of subclinical mastitis at ~46.35% on a cow-basis and highlighting widespread occurrence