AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 03, Issue: 03 (March, 2026)
Available online at http://www.agrimagazine.in
©Agri Magazine, ISSN: 3048-8656

Climate Change: A Growing Challenge for Dairy Animals in India

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India experiences a tropical monsoon climate, characterized by distinct wet and dry seasons. The climate varies significantly across the country due to factors such as latitude, topography, and proximity to the Indian Ocean. Geographically, India can be broadly divided into four major regions: the Himalayan region, the Indo-Gangetic Plain, the Deccan Plateau, and the coastal areas.

Climate change has a significant impact on dairy animals, affecting their milk production, reproduction, and overall health. Rising temperatures and increased humidity levels lead to heat stress, which can reduce milk production by 10–25% and negatively affect reproductive performance. Research shows that a 1°C increase in average maximum temperature leads to a 2.4% decrease in milk yield in cattle and a 2.1% decrease in buffalo milk yield. Similarly, an increase in minimum temperature results in a 3.6% reduction in milk yield in cattle and 2.5% in buffaloes.

India is highly vulnerable to climate change because of its large population, diverse geography, and heavy dependence on natural resources. The country is experiencing rising temperatures, changing rainfall patterns, and more frequent extreme weather events such as floods and droughts. These impacts mainly affect poor and vulnerable communities. Additionally, India faces environmental challenges such as air pollution, water scarcity, and agricultural stress, particularly in the central regions of the country.

Impact on Milk Production

Heat stress reduces feed intake in dairy animals, which leads to a decline in milk production. Studies indicate that each unit increase in heat stress can reduce milk yield by about 2.13% in humid tropical climates. High-producing dairy cows are more vulnerable to heat stress because their metabolic rate is higher, making it difficult for them to regulate body temperature.

Estimated annual milk loss due to heat stress:

- **India:** Around 1.8 million tons of milk loss, causing economic losses of approximately $0.38 billion.
- **United States**: Milk production is projected to decline by 1–2% by 2030, leading to significant economic losses in the dairy sector.

Some studies also predict that milk production could decline by up to 50% in certain regions by 2050, particularly in countries like China, due to increasing temperatures and climate stress.

Impact on Reproduction

- Heat stress negatively affects the reproductive system of dairy cows, resulting in lower conception rates and longer calving intervals.
- Severe heat stress may lead to reproductive failures and infertility problems in dairy animals.

Regional Variations

Tropical Regions: Dairy cattle in tropical countries are more vulnerable to heat stress because animals are often raised under extensive management systems with limited cooling facilities.

Temperate Regions: Even in temperate regions, heat waves and sudden temperature increases can significantly affect dairy cattle and reduce productivity.

Mitigation Strategies

Cooling Systems: Installing ventilation systems, fans, and sprinklers in dairy farms can help reduce heat stress in animals.

Breeding Heat-Tolerant Breeds: Developing and promoting heat-resistant breeds can help reduce the negative impacts of climate change on dairy production.

Improved Management Practices: Better feeding strategies, proper housing, and farm management practices can reduce the effects of heat stress on dairy cattle.

Key Findings

- Heat stress significantly reduces milk production and fertility in dairy animals.
- Changing rainfall patterns and extreme weather events affect feed availability and quality.
- Climate change increases the spread of diseases and parasites among dairy animals.

Recommendations

- Implement heat stress mitigation strategies such as providing shade, ventilation, and cooling systems.
- Promote climate-resilient dairy breeds and breeding programs.
- Adopt climate-smart agricultural practices such as agroforestry and conservation agriculture.
- Strengthening disease surveillance and monitoring systems.
- Support dairy farmers through climate information services, insurance programs, and training initiatives.

Future Directions

- Conduct further research on the impacts of climate change on dairy animals in India.
- Develop and promote climate-resilient dairy production systems.
- Strengthening institutional and policy frameworks to support climate change adaptation in the dairy sector.

Conclusion

Climate change presents serious challenges for dairy farm animals in India, affecting their productivity, health, and overall welfare. Rising temperatures and changing rainfall patterns increase heat stress, reduce the quality and availability of feed, and increase the risk of diseases. These impacts lead to lower milk production, reproductive problems, and higher mortality rates among dairy animals. Therefore, adopting effective management practices and climate-resilient strategies is essential to protect dairy animals and sustain the dairy sector in India.

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