


Editorial

Climate change and its impact on animal health and food safety

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Climate change has emerged as one of the defining challenges of our time, affecting not only the environment but also agriculture, animal production, and public health. Across many parts of the world, rising temperatures, irregular rainfall patterns, prolonged droughts, floods, and other extreme weather events are becoming increasingly common. These environmental changes are creating new pressures on livestock production systems and raising concerns about the safety of the food supply. As livestock contribute substantially to food security, rural livelihoods, and national economies, the sector is particularly vulnerable to climate-related disruptions (Ali *et al.*, 2020; Pandey *et al.*, 2022). The situation is especially concerning in developing countries such as Bangladesh, where livestock production often depends on climate-sensitive farming systems and limited adaptive resources. In recent years, the consequences have become increasingly visible through declining animal productivity, changing disease patterns, and growing food safety challenges.

The effects of climate change on animal health are both direct and indirect. One of the most immediate consequences is heat stress, which affects the physiological performance and welfare of livestock and poultry. During periods of excessive heat, animals tend to consume less feed, resulting in reduced growth rates and lower production efficiency. Reproductive performance may also decline, while prolonged heat exposure can weaken immune responses and increase disease susceptibility (Polsky and von Keyserlingk, 2017). These impacts are not only biological but also economic, as lower milk yields, reduced meat production, and higher mortality rates can significantly affect farm profitability.

Changing climatic conditions are also altering the epidemiology of infectious diseases. Variations in temperature, humidity, and rainfall can influence the survival and transmission of pathogens and their vectors, allowing diseases to emerge in areas where they were previously uncommon (Forman *et al.*, 2008; Abdela and Jilo, 2016). As environmental conditions become more favorable for pathogen persistence, livestock populations may face an increased risk of both endemic and emerging diseases. In addition, several zoonotic and foodborne pathogens, including those associated with colibacillosis, salmonellosis, Peste des Petits Ruminants and campylobacteriosis, may pose greater threats to animal and human health under changing environmental conditions (Kabir, 2010; Akter *et al.*, 2021).

These concerns are closely linked to the One Health concept, which recognizes that the health of humans, animals, and ecosystems is interconnected. Climate-driven environmental changes can influence pathogen ecology, increase contamination of feed and water resources, and create conditions that favor disease transmission. Such changes have important implications not only for animal health but also for food safety and public health. Growing evidence suggests that climate-related environmental stress may also contribute to the emergence and spread of antimicrobial resistance (AMR), an issue that is increasingly recognized as a global health threat (WHO, 2024).

In Bangladesh, the challenge is particularly significant. Studies have reported the widespread occurrence of multidrug-resistant zoonotic bacteria in livestock farms, live bird markets, and environmental sources (Neogi *et al.*, 2020; Uddin *et al.*, 2021; Hoque *et al.*, 2021). The continued detection of pathogens such as *Campylobacter* spp., *Escherichia coli*, and *Vibrio cholerae* within animal production environments and food chains highlights the vulnerability of existing food safety systems (Alam *et al.*, 2020; Eashmen *et al.*, 2021; Abdullah-Al-Mamun *et al.*, 2023). As climatic conditions become more unpredictable, the risks associated with pathogen transmission and food contamination are likely to increase further.

Food safety is another area where the effects of climate change are becoming increasingly evident. Environmental conditions play a major role in determining the growth, survival, and transmission of foodborne pathogens. Higher temperatures and increased humidity can accelerate microbial proliferation in foods of animal origin as well as fresh produce, thereby increasing the risk of contamination and foodborne illness (Tirado *et al.*, 2010; Duchenne-Moutien and Neetoo, 2021). These challenges are particularly acute in developing countries, where limitations in food storage, transportation, and market infrastructure may compromise food quality and safety. In addition to microbial hazards, climate change may influence the occurrence of naturally occurring toxins in the food chain. Changes in temperature and moisture conditions can promote fungal growth and increase the production of mycotoxins in feed and food commodities. Recent findings on aflatoxin contamination in Bangladesh have highlighted the close relationship between climatic variability and food safety risks (Neogi *et al.*, 2024; Atasever, 2026). Such contamination not only affects animal productivity but also poses serious health concerns for consumers through the consumption of contaminated animal products and food crops (Islam *et al.*, 2026). Consequently, climate change is increasingly being recognized as a factor that can influence food safety from farm to fork.

The growing threat of antimicrobial resistance adds another layer of complexity to these challenges. Livestock producers facing increased disease pressure may rely more heavily on antimicrobial agents to prevent or control infections. While antimicrobials remain important tools in animal health management, their excessive or inappropriate use can contribute to the development and spread of resistant microorganisms. Environmental stressors associated with climate change may therefore indirectly accelerate the emergence of antimicrobial resistance by increasing disease occurrence and treatment demands within livestock populations (Kabir, 2026). This issue is of particular concern because resistant bacteria do not remain confined to farms. They can spread through food products, environmental pathways, and direct contact between animals and humans. Reports describing the occurrence of extended-spectrum beta-lactamase-producing *Escherichia coli* in food-associated environments and on frequently touched surfaces illustrate the widespread nature of this problem (Arif *et al.*, 2025). Addressing antimicrobial resistance will require coordinated efforts that promote prudent antimicrobial use, strengthen farm biosecurity, and improve surveillance systems across the human, animal, and environmental sectors.

Among the countries most vulnerable to climate change, Bangladesh faces a unique set of challenges. Its geographical location and environmental characteristics make it particularly susceptible to floods, cyclones, salinity intrusion, and heat waves. These events frequently disrupt livestock production systems, damage infrastructure, and threaten the livelihoods of farming communities (Ali *et al.*, 2020). Smallholder farmers are often the most affected because they have limited access to financial resources, veterinary services, and climate adaptation technologies. Despite these challenges, several practical measures can help improve the resilience of livestock production systems. Better housing design, improved ventilation, and access to clean water can reduce the effects of heat stress on animals. The introduction of climate-resilient and heat-tolerant breeds may further support productivity under changing environmental conditions. Likewise, strengthening vaccination programs, enhancing disease surveillance, and adopting sustainable feeding strategies can help reduce disease risks and improve overall herd health (Gebremichael *et al.*, 2023).

Recent initiatives promoting environmentally sustainable livestock production also offer promising opportunities for adaptation. Organic dairy farming, sustainable livestock upgrading programs, and resource-efficient production systems are increasingly being recognized as approaches that can improve resilience while reducing environmental impacts (Harun *et al.*, 2024; Bhuiyan, 2024). Such strategies are particularly relevant for Bangladesh, where balancing productivity, environmental sustainability, and food security remains a major development priority. Adaptation efforts, however, cannot rely solely on farm-level interventions. Effective food safety governance and public awareness are equally important. Ensuring the safety of foods of animal origin requires continuous attention to hygienic production practices, safe slaughtering procedures, proper food handling, and regulatory compliance throughout the food chain (Rahman and Kabir, 2012; Rahman and Kabir, 2013; Rahman *et al.*, 2014). Training programs for farmers, food handlers, and veterinary professionals can play a crucial role in reducing food safety risks and improving disease prevention practices.

Advances in biotechnology and sustainable agricultural innovations may also contribute to future solutions. The use of probiotics, improved diagnostic tools, and modern disease monitoring systems has shown considerable potential for enhancing animal health and reducing dependence on antimicrobial agents (Kabir and Islam, 2021; Kabir *et al.*, 2023). At the same time, ecosystem-based adaptation strategies are gaining attention as effective means of strengthening resilience to climate-related challenges while supporting environmental sustainability (Neogi, 2025; Neogi, 2026). The international community has repeatedly emphasized the need for integrated responses to climate change. Organizations such as the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) have highlighted the importance of developing climate adaptation and mitigation strategies that address agriculture, animal health, and food systems in a coordinated manner (FAO, 2023; WHO, 2024). Given the complex and interconnected nature of these challenges, no single discipline or sector can provide all the answers.

A comprehensive One Health approach offers a practical framework for addressing the growing impacts of climate change on animal health and food safety. By fostering collaboration among veterinarians, microbiologists, environmental scientists, public health professionals, and policymakers, it becomes possible to develop more effective and sustainable solutions. Strengthening animal health systems, improving food safety oversight, reducing environmental impacts, and promoting sustainable livestock production should therefore remain central priorities in future climate adaptation efforts (Verkuijl *et al.*, 2024; Sicuso *et al.*, 2025).

The consequences of climate change for animal health and food safety are no longer theoretical concerns; they are already being observed across many regions of the world, including Bangladesh. Increasing disease risks, foodborne hazards, antimicrobial resistance, and environmental contamination present significant challenges for livestock production and public health. Addressing these issues will require stronger surveillance systems, climate-resilient farming practices, effective food safety governance, and sustained investment in research and innovation. Integrating One Health principles into policy and practice will be essential for protecting animal health, safeguarding public health, and ensuring food security in an increasingly uncertain climate.

Ethical approval and informed consent

Not applicable.

Data availability

Not applicable.

Conflict of interest

None to declare.

Author's contribution

Conceptualization, formal analysis, writing-original draft preparation, review and editing: S. M. Lutful Kabir. The author has read and approved the final version of the published editorial.

References

- Abdela N and K Jilo, 2016. Impact of climate change on livestock health: a review. *Glob. Vet.*, 16: 419-424.
- Abdullah-Al-Mamun S, MR Islam, F Islam, M Arif, Y Deneke, SS Islam, MH Sikder and SML Kabir, 2023. Prevalence, virulence gene profile and antibiogram of *Campylobacter jejuni* from fresh vegetables in Mymensingh, Bangladesh. *Asian Australas. J. Food Saf. Secur.*, 7: 62-72.
- Akter M, C Sarker, A Kayser, DR Pal and ML Mollah, 2021. A study on prevalence and therapeutic assessment of Peste des Petits Ruminants in goat at Upazilla Veterinary Hospital Babugonj in Barishal District of Bangladesh. *Asian Australas. J. Biosci. Biotechnol.*, 6: 142-146.
- Alam B, MN Uddin, D Mridha, AHMT Akhter, SS Islam, AKMZ Haque and SML Kabir, 2020. Occurrence of *Campylobacter* spp. in selected small scale commercial broiler farms of Bangladesh related to good farm practices. *Microorganisms*, 8: 1778.
- Ali MZ, G Carlile and M Giasuddin, 2020. Impact of global climate change on livestock health: Bangladesh perspective. *Open Vet. J.*, 10: 178-188.
- Arif M, AU Hosna, I Jahan, MA Nobi, MSA Shathi, MN Hasan, J Hassan and SML Kabir, 2025. Diarrheagenic and ESBL potential of *Escherichia coli* from publicly shared common touch surfaces. *MicrobiologyOpen*, 14: e70125.
- Atasever M, 2026. Foodborne microbial diseases: pathogens, epidemiology, and prevention strategies. *Asian Australas. J. Food Saf. Secur.*, 10: 20-42.

- Bhuiyan MSA, 2024. Upgradation of cattle under smallholder farming system in Bangladesh: pros and cons. *Asian Australas. J. Biosci. Biotechnol.*, 9: 24-26.
- Duchenne-Moutien RA and H Neetoo, 2021. Climate change and emerging food safety issues: a review. *J. Food Prot.*, 84: 1884-1897.
- Eashmen N, M Arif, B Sarker, MR Akter and SML Kabir, 2021. Prevalence and antimicrobial susceptibility patterns of *Vibrio cholerae* in dairy excreta. *Asian Australas. J. Biosci. Biotechnol.*, 6: 40-49.
- FAO, 2023. Climate change: impact on animal health and food safety. Available at: <https://www.fao.org/climate-change>.
- Forman S, N Hungerford, M Yamakawa, T Yanase, HJ Tsai, YS Joo, DK Yang and JJ Nha, 2008. Climate change impacts and risks for animal health in Asia. *Rev. Sci. Tech.*, 27: 581-597.
- Gebremichael B, D Kefyalew, Z Mulatu, M Abdurahaman and W Tafese, 2023. Impact of climate change on animal health and production. *International Journal of Climatic Studies*, 2: 1-15.
- Harun AB, AA Bayazid, MN Hoque and ZC Das, 2024. Organic dairy farming in Bangladesh: current status, challenges and prospects. *Asian Australas. J. Food Saf. Secur.*, 8: 13-26.
- Hoque N, SS Islam, MN Uddin, M Arif, AKMZ Haque, SB Neogi, MM Hossain, S Yamasaki and SML Kabir, 2021. Prevalence, risk factors, and molecular detection of *Campylobacter* in farmed cattle of selected districts in Bangladesh. *Pathogens*, 10: 313.
- Islam MR, N Islam, MA Nobil, AKMZ Haque, SS Islam, AKMA Rahman, MFR Khan and SML Kabir, 2026. Knowledge, attitudes, and practices of poultry vendors toward food safety in traditional markets in Mymensingh, Bangladesh: implications for One Health and public health interventions. *Int. J. One Health*, 12: 85-105.
- Kabir SML, 2010. Avian colibacillosis and salmonellosis: a closer look at epidemiology, pathogenesis, diagnosis, control and public health concerns. *Int. J. Environ. Res. Public Health*, 7: 89-114.
- Kabir SML, 2026. Antimicrobial resistance in zoonotic bacteria in Bangladesh: a converging crisis at the human–animal–environment interface. *Asian J. Med. Biol. Res.*, 12: 1-4.
- Kabir SML and SS Islam, 2021. Biotechnological applications in poultry farming. In: *Sustainable Agriculture Reviews 54*. Edited by: VK Yata, AK Mohanty and E Lichtfouse. 233-271 Springer, Cham.
- Kabir SML, SS Islam, TA Ferdous and AHMT Akhter, 2023. Production, cost analysis, and marketing of probiotics. In: *Food Microbiology Based Entrepreneurship*. Edited by: N Amaran, D Dharumadurai and OO Babalola. 305–326 Springer, Singapore.
- Neogi SB, MM Islam, SS Islam, AHMT Akhter, MMH Sikder, S Yamasaki and SML Kabir, 2020. Risk of multi-drug resistant *Campylobacter* spp. and residual antimicrobials at poultry farms and live bird markets in Bangladesh. *BMC Infect. Dis.*, 20: 278.
- Neogi SB, MN Uddin, M Arif, AR Sen, PR Paul, MJI Saddam, AKMZ Haque, S Samosornsuk, W Samosornsuk and SML Kabir, 2024. Influence of climatic factors on spatio-temporal variabilities in the occurrence of aflatoxins in major food grains available at retail shops in Bangladesh. *Asian Australas. J. Food Saf. Secur.*, 8: 32-47.
- Neogi SB, 2025. Addressing the climate-food-health nexus: strengthening ecosystem-based adaptation and One Health. *Asian Australas. J. Food Saf. Secur.*, 9: 1-4.
- Neogi SB, 2026. Reconfiguring livestock value chains for climate resilience: circular and nature-based transitions through transdisciplinary governance. *Asian Australas. J. Food Saf. Secur.*, 10: 1-5.
- Pandey A, VK Gururaj, V Bhardwaj, A Kumar, P Das and G Singh, 2022. Impact of climate change on animal health and animal production. *Indian J. Anim. Health*, 61: 147-154.
- Polsky L and MAG von Keyserlingk, 2017. Effects of heat stress on dairy cattle welfare. *J. Dairy Sci.*, 100: 8645-8657.
- Rahman MM and SML Kabir, 2012. Developing awareness profiling force and activities linking safety and quality of foods of animal origin in Bangladesh. *Sci. J. Rev.*, 1: 84-104.
- Rahman MM and SML Kabir, 2013. Veterinary education on fostering food safety and governance achieving a healthy nation in Bangladesh. *Vet. Sci. Dev.*, 3: 16-23.
- Rahman MM, SML Kabir, MM Khatun, MH Rahman and NP Ansari, 2014. Past, present and future driving force in the enforcement and management of food safety law in Bangladesh. *Health, Safety and Environment*, 2: 103-122.
- Sicuso D, A Previti, M Pugliese and A Passantino, 2025. Climate change impacts on livestock and resulting effects on animal health: current challenges in food safety, consumer protection, and animal welfare. *J. Consum. Prot. Food Saf.*, 20: 1-3.

- Tirado MC, R Clarke, LA Jaykus, A McQuatters-Gollop and JM Frank, 2010. Climate change and food safety: a review. *Food Res. Int.*, 43: 1745-1765.
- Uddin MN, SB Neogi, SS Islam, J Ferdous, MSR Khan, S Yamasaki and SML Kabir, 2021. Occurrence and multidrug resistance of *Campylobacter* spp. at duck farms and associated environmental and anthropogenic risk factors in Bangladesh. *BMC Infect. Dis.*, 21: 1139.
- Verkuijl C, J Smit, JMH Green, RE Nordquist, J Sebo, MN Hayek and MJ Hötzel, 2024. Climate change, public health, and animal welfare: towards a One Health approach to reducing animal agriculture's climate footprint. *Front. Anim. Sci.*, 5: 1281450.
- WHO, 2024. Antimicrobial resistance and climate change. Available at: <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>.