

Understanding The Multi-Faceted Impact of Climate Change on Livestock: Direct and Indirect Consequences Explored

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Introduction

A significant global danger to the sustainability of livestock systems is climate change. Thus, reducing the negative effects of harsh climates and adapting to them have been crucial in reducing the impact of climate change on livestock. Global temperature increases are typically linked to climate change. According to a number of climate model forecasts, the mean global temperature may rise by 1.1–6.4 °C by the year 2100. Extreme weather conditions, such as prolonged heat waves, floods, and droughts, provide a challenge to livestock. Severe occurrences cause cattle deaths in addition to production losses. Animals can adjust to hot weather, but their survival-oriented response mechanisms may compromise their ability to function. Consequently, a key strategy in reducing the negative effects of harsh climates on cattle productivity has been adaptation and mitigation. Heat stress appears to be one of the interesting environmental conditions that challenges animal productivity in many parts of the world among the variables affecting animals. At 40% of the agricultural GDP, the cattle industry is important to the agricultural sector in emerging countries. The necessity to increase livestock production is evident due to the rising demand for meals originating from animals worldwide (FAO, 2009). Adverse weather conditions have a negative impact on livestock. A drop in production and reproduction efficiency can result from climate extremes and seasonal variations in the quantity and quality of herbage, which can also have an impact on livestock welfare.

Direct effects of climate change on livestock

1. High temperature:

- **Reduced productivity:** Higher temperatures can lead to heat stress, reducing feed intake and growth rates in livestock. Heat-stressed animals produce less milk, meat, and eggs.

- **Health issue:** Heat stress can cause respiratory problems, decreased fertility, and increased mortality rates. It also makes animals more susceptible to diseases.

2. Photoperiod:

Photoperiod is the duration of light and darkness within a 24-hour period, has a significant direct impact on livestock. This effect is mainly due to the influence of light on the physiological and behavioural processes of animals. Some key points illustrating the effect of photoperiod:

- **Hormonal regulation:** Light affects the production of melatonin in the pineal gland, which in turn influences reproductive hormones. For instance, longer daylight periods reduce melatonin secretion, which can promote reproductive activity in long-day breeders like horses and inhibit it in shorty day breeders like sheep.
- **Growth rates:** Photoperiod can affect growth rates in livestock. For example, longer daylight exposure can increase feed intake and growth rates in poultry and pigs.
- **Immune response:** Photoperiod can also affect the immune function of livestock. For example, certain immune responses may be heightened during longer daylight periods, potentially reducing the incidence of disease.
- **Puberty onset:** The timing of puberty in animals can be affected by photoperiod. In cattle, heifers exposed to longer daylight hours may reach earlier than those exposed to shorter daylight.

3. Rainfall:

Rainfall has several direct effects on livestock, influencing their health, productivity, and overall well-being. These effects can be both positive and negative, depending on the amount and timing of the rainfall. Increased rainfall necessitates adequate shelter for livestock to protect them from prolonged exposure to wet conditions, which can lead to hypothermia and other health issues. Adequate rainfall ensures a steady supply of feed. Conversely, insufficient rainfall can lead to drought conditions, reducing feed availability and leading to malnutrition and weight loss in livestock.

Indirect effects of climate change on livestock

Indirect effects of climate change, such as decreased or non-existent feed and water resources, account for the majority of output losses. There is a chance that climate change

would affect large-scale rangeland vegetation patterns, the amount and consistency of forage produced, the quality of forage, and the amount of water required to grow forage crops. Rising temperatures, increased carbon dioxide levels, and drastically varying water availability from shifting precipitation patterns will all continue to affect crops and forage plants in the months and years to come. According to (Giridhar and Samireddypalle 2015), climate change has the potential to negatively impact other ecological roles of grasslands in addition to forage production. It can also have an adverse effect on species composition, productivity, and quality. Forage output will be significantly impacted by the vast variations in rainfall distribution during the growing season that occur in many parts of the world. Livestock production systems are expected to experience more negative consequences than positive ones as a result of the predicted emerging scenarios that are already visible from the effects of climate change. Severe economic losses will also be caused by newly developing diseases, such as vector-borne illnesses that could emerge as a result of climate change.

Effects of climate change on livestock production

Economic losses are incurred by the livestock industries because farm animals are generally raised in locations and/or seasons where temperature conditions go beyond their thermal comfort zone. Losses considered were:

- Decreased performance (growth, lactation).
- Increased mortality.
- Decreased reproduction.

The livelihood of locals in developing countries depends critically on local natural resource-based activities, such as crop and livestock production. As a result of negative weather impact on livestock rearing, the livelihood of shepherds/farmers whose size of income depends on the performance of these animals is endangered.

Mitigation and Adaptation strategies

- Ensuring adequate water supply: Through better water management and infrastructure.
- Improving shelter and ventilation: To reduce heat stress.
- Modifying feeding practices: Including use of drought-resistant forage crops.
- Enhancing disease monitoring and control: To manage the spread of new and existing disease.



- Implementing policy measures: To support adaptation and provide financial assistance to vulnerable producers.
- Modify diet and nutrition for livestock.
- Provide shade and sprinklers for outdoor animals.
- Diversify livestock species.

By adopting these strategies, livestock producers can mitigate the adverse effects of climate Change and Enhance the Resilience of Their Production Systems.

Conclusion

In conclusion, climate change poses substantial risks to livestock production through direct and indirect effects on animal health, productivity, and resource availability. Proactive adaptation and mitigation strategies are essential to safeguard livestock systems and ensure food security in the face of a changing climate.

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