



Different Constraints for Livestock Production in The Changing Climate Scenario

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Abstract:

The majority of mammalian biomass on Earth is made up of livestock. More than a billion poor people rely on livestock for their daily needs. Climate is the average weather over a lengthy period of time, usually thirty years. Climate change needs to be evaluated at the household level in order to focus the ones that are deprived and vulnerable who depends on agriculture. One of the main causes of climate change is anthropogenic activity. Climate change, on the other hand, poses a threat to livestock production due to its effects on biodiversity, animal illnesses, animal reproduction, water availability, feed crop and forage quality, and milk production. We can broadly categorize the impacts of climate change into direct and indirect effects.

Keywords: Livestock, climate change, impacts, direct and indirect effects.

Introduction:

Livestocks are essential to modern society because they directly support crop production with manure and draught power, food security and nutrition, and serve as a source of income, jobs, meet social and cultural requirements (Thornton *et al.*, 2013). Despite uncertainty surrounding variations in the climate, the IPCC Fifth Assessment Report estimated the "likely range" of a rise in the global average surface temperature by 2100 to be between 0.3°C and 4.8°C (IPCC, 2013). Climate change represents the average and fluctuations of meteorological factors across periods varying from months to millions of years. Changes in the quantity and quality of feed crops and forage, water availability, animal growth and milk production, feed intake, heat stress, diseases, reproduction, health and mortality, and biodiversity (Reynolds *et al.*, 2010) are some of the possible effects on livestock.

Impact of Climate Change on Livestock Production:

Variations in precipitation, increasing temperature and concentration of carbon dioxide (CO₂) in the atmosphere are the main causes of these effects, in accordance with (Collier *et al.*, 2019), the term "direct effects" describes how the environment and CO₂ affect the metabolism, thermoregulation, immunological response, and various productions of livestock. Indirect effects describe the impacts of climate on pest/pathogen populations, feed

productivity, and water availability. In many regions there is an uncertainty that livestock performance will be impacted by climate change, and most prediction models indicate that these effects will be deleterious. In few years, there may be abrupt shifts in climate or more subtly over decades. Climate change is commonly linked to a rise in the Earth's overall temperature. Although animals can adapt to hot climates, the mechanisms they employ for survival may have negative effects on their overall performance.

The Various Impacts of Climate Change Are as Follows:

1. Feed quantity and quality:

These are primarily affected by increasing atmospheric CO₂ levels and temperature (Chapman *et al.*, 2012), which cause variations in concentrations of water-soluble carbohydrates and nitrogen. The impact of climate change on forage quantity and quality will vary depending on location, farming system, and species (IFAD, 2010).

2. Water Availability:

Climate change is expected to change water availability and water consumption in livestock production. Rising temperatures are expected to increase not only water use for irrigation, but also water use per animal and per land area. Another problem is water salination caused by sea level rise). Competition for water between livestock, crops, and non-agricultural use will intensify in the coming decades, requiring more efficient production systems to address water scarcity issues (Reynolds *et al.*, 2010).

3. Meat and Milk Production:

Dairy cows that are under heat stress consume less dry matter in their feed, which accounts for about 35% of the drop in milk production in the meantime, the most productive breeds of dairy cows show greater vulnerability to heat stress because they are larger and release more metabolic heat than lower-producing types. As a result, milk production decreases due to increased metabolic heat production due to heat stress. Meat production of all major livestock species have been found to be affected by heat stress (Gonzalez-Rivas *et al.*, 2020). Heat-stressed ruminants exhibit reduced body size, carcass weight, fat thickness, and meat quality.

4. Feed Intake:

Inappetence or anorexia is one of the common effects of high environmental temperatures. Ruminants encounter decreased appetite, intestine motility, and rumination as a result of increased ambient temperature. As environmental temperatures rise above 25–26 °C, feed intake of the lactating dairy cow decreases, and this decline happens more quickly above 30 °C. Among ruminants, heat stress has less influence on goats. When the ambient temperature rises above their thermal comfort zone by more than 10 °C, voluntary feed intake of the goats decreases (Yadav *et al.*, 2013).

5. Livestock Diseases:

Climate change can have a significant impact on the occurrence, prevalence, and spread of livestock diseases. For example, the distribution and impact of vector-borne diseases such as Rift Valley fever, African horse disease, and bluetongue vary widely due to seasonal and long-term climate change (Baylis and Githeko 2006).

6. Reproductive process:

Reproductive process are affected by heat stress. Pregnancy rates in dairy cows can drop by 20-27% in the summer, with heat-stressed cows experiencing reduced estradiol secretion from dominant follicles that develop in an environment low in luteinizing hormone. Reduced reproductive efficiency due to heat stress leads to

changes in ovarian function and embryonic development by reducing the fertilization potential of eggs and resulting embryos (Naqvi et al., 2012).

7. Biodiversity:

Populations with reduced genetic biodiversity are at risk, and one of the direct drivers of this biodiversity loss is climate change (UNEP, 2012). Alteration in the climate could lead to the extinction of 15-37% of all species around the world (Thomas et al., 2004).

Conclusion:

Increased heat stress as a result of climate change can have a direct impact on livestock production, while indirect effects include changes in the quantity and quality of feeds, changes in the availability of land and water. Associated adaptation techniques might focus on changing the production and management systems or directly target animal responses by modifying the animals' environment and feeding. Climate change needs to be evaluated at the household level in order to focus the ones that are deprived and vulnerable who depends on agriculture. Strategies for livestock adaptation and mitigation could be helpful in reducing the effects of climate change.

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