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IMPACT OF CLIMATE CHANGE ON LIVESTOCK PRODUCTIVITY

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Climate changes are referred to as shifts in average conditions in normal temperature and the weather pattern. According to FAO, the livestock sector contributes 40% to the agricultural GDP which provides 33% of total global protein and 17% of total global calories consumed. In addition to this, livestock provides livelihood, food & income source for parts of the community. Demand for foods of animal origin is highly growing due to increasing population and its urbanisation which implies that the livestock sector needs to expand. Climate change is mainly associated with an increase in global temperature. Studies suggest that mean global temperature may be 1.1-6.4ºC warmer by the year 2100 than in 2010. As the organ system of livestock is sensitive to change in physical, chemical, biological and climatic stimuli from the surroundings, change in climatic normal values affects the growth, milk & meat production, wool production, adaptation capacity and reproduction rate of the livestock which may result in retrogressive graphs in productivity of livestock. The difficulty faced by livestock is due to extreme weather conditions such as floods, intense heat waves and droughts, which count as direct effects which can lead to production losses as well as events like livestock death. Climatic fluctuations and extreme conditions can lead to retrogressive change in quality and quantity of herbages which livestock consume, which count as an indirect effect, ultimately lead to deterioration of livestock health and productivity. Also, livestock contribute to emission of greenhouse gases (GHGs) directly or indirectly. In this article, we have included the adverse impact of climatic changes on livestock productivity which will help in better understanding of the reasons and its effects.

Effects of Climate Change on Livestock

A) Direct Effect

Direct effect of climate change on animals is through "Heat stress". This involves humidity, air temperature and air movement altogether.

1. **Effect on feed intake-** 1. Heat stress lowers the feed intake and feed conversion ratio which causes a decrease in average daily weight gain of the animal. Which ultimately leads to low body condition scoring. This results in hindrance in normal growth of the animal. 2. In poultry birds, increase in temperature can lead to a 9.5% decrease in feed intake and ultimately leads to lowering of feed conversion efficiency.

2. **Effect on animal production-** 1. Heat stress affects not only milk quantity but also deteriorates milk composition. 2.In lactating animals, an increase in temperature activates the stress response system. In response to this, the dry matter feed intake of dairy cows decreases. This results in negative energy balance in them. Also, during heat stress, most of the energy is used by animals to adapt to the increasing temperature. So, the energy requirement would not be enough to cover the daily requirement for milk production.3. Decline in milk yield, low solid not fat (SNF) low protein content.

3. **Effect on animal reproduction-**1. Temperature decreases the oestrus expression and conception rate which leads to low rate of fertilisation.2. In males as spermatogenesis is temperature sensitive, rise in temperature causes low semen quality, low testicular volume and a poor sperm fertility rate. 3.Poultry reproduction also seems to be affected by heat stress. Environmental stress can delay the process of ovulation, results in reduction of yolk quality and affects hatchability.

4. **Adaptive effects-** 1. The adaptive effects such as, increase in water intake,rise in rectal temperature, rise in cortisol level are evident.

5. **Effect on development of pathogens/ susceptibility to disease -** 1. Rise in temperature may cause an increase in rate of development of pathogens or parasites that spend some of their life cycle outside their animal host. 2.Due to high temperatures, many countries become susceptible to increase in animal diseases and

poor countries become more prone to emerging diseases. This lowers the graph of productivity of livestock.

6. **Morbidity and mortality effects-** 1. Livestock become more susceptible to diseases such as mastitis,tick borne diseases as heat stress negatively affects the immunity of the animal. This leads to increased morbidity and mortality in livestock.

B) Indirect Effects

As for growth and development of animals, good quantity and quality of forage must be fed to them. Adequate water content in the body gives quality milk and meat products. Feed of livestock includes forages and grain or oilseed crop plants mostly. Production of these is affected by change in temperature, water supply, soil moisture, etc which ultimately changes the productivity of livestock.

1. **Forage quality -** 1. Proper weight gains and good production and reproduction in animals requires good nutrition, both in quality & quantity. Change in climatic conditions from their favourable ones can lead to increased content of lignin and results in reduced digestibility in animals. 2. Some plants (C4) show a retrogressive effect of increased CO2 concentration too, which lowers the availability and quality of crops. It also produces toxicity in plants & decreases proteins and minerals in plants. This combined results in ingestion of poor quality of feed by livestock.

2. **Water resources -** 1. Water requirements of plants and animals increases as the hotter and drier conditions in the environment appear, especially in the water stressed regions.2. In the extreme conditions like drought and floods, the quality of water consumed by the animal decreases, through increased salts, sediments, nutrients, toxic substances, and pollutants in water. This results in poor health and toxic effects on livestock.

C) Effect of Emission of GHGs From Livestock Production Itself

How does livestock farming contribute to greenhouse gas emission?

- In the livestock farming practice mainly two gases are produced which are, Methane & nitrous oxide.
- According to studies, Animals which are raised for food add to about 16.5 percent of greenhouse gas pollution globally.

- Ruminant animals which are reared for food purposes emit methane through "enteric fermentation" process during digestion of feed.
- Digestive part of these animals decomposes and ferment the parts of plants like starch, fibre and sugars. During this process, a toxic gas that is methane is released into the atmosphere predominantly through burps.
- Release of methane from livestock manure is also a source of emission.
- Various farm practices contribute to nitrous oxide pollution through application of fertilisers (Synthetic and Organic) for growing food for animals and humans both.
- An intensive grazing practice can lead to extensive deposition of large amounts of Nitrogen via animal excreta through faeces and urine, which is used to produce manure.
- Nitrification and denitrification of nitrogen present in manure leads to emission of N2O. This is how livestock production practices can lead to GHGs emission which ultimately leads to increased global temperature and has detrimental effects on them itself.

Conclusion

Climate change has an adverse effect on livestock production and productivity both in- direct and direct ways. Ever increasing population coupled with rapid industrialization play an important role in changing climatic scenario as evidenced with frequent occurrence of natural calamities, un-timely and inadequate rainfall. Agrarian country like India where more than 70% people depend upon agriculture and allied sector for their livelihood sustenance will face many adverse consequences due to the ongoing climatic change which needs to be addressed by the policy holders as well as all stake holders by adopting suitable necessary precautionary measures in times to come.

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