

## The Effect of Climate Change and Global Warming on Animal Welfare in Pakistan

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### Abstract

Pakistan is an agricultural country and its economy especially in rural areas mostly depends on the agriculture production including livestock sector output. Livestock provides food security in both urban and rural areas and helps to reduce poverty by selling animals and their food products. However, because Pakistan has a tropical climate, so it is more affected by climate change. This climate change directly or indirectly affects the Livestock sector. In this article we discuss how livestock is an important sector in terms of food security and economically beneficial in Pakistan. These climate change factors involve water scarcity, heat stress, drought stress and floods which can decrease the livestock production. Livestock products include milk, butter, meat and eggs will also decrease automatically which leads to the loss of food security. Climate change also can cause many diseases and mortalities in animals which leads to great economy loss for rural families in Pakistan. It also affects the feed sources of livestock like deficiency in grass nutrient level and loss of vitamins and minerals in crops productivity and quality. There should be proper management and strategies to mitigate the effects of climate change and to increase livestock production in Pakistan.

**Keywords:** *Climate change, Tropical, Livestock, Food security, Economy*

### Introduction

Pakistan is the sixteenth most susceptible country to climate change (Maplecroft, 2010). As the foundation of the economy, the agricultural sector including livestock is more likely to be affected by environmental change. Pakistan is at risk from climate change, which has serious geopolitical ramifications and is caused by several reasons, including fast industrialization and urbanization. The nation has mild weather and is in a tropical area. Over the past 20 years, Pakistan has been listed as one of the top 10 nations most impacted by climate change. Climate change has had two effects on livestock:

- (i) it influenced the production of fodder, and
- (ii) it had a direct impact on the animals' household in various production methods.

The losses incurred by the animals in past years were caused by both heat stress and natural calamities. The worst drought episode (1998–2002) in Cholistan and Tharparkar is one of the causes of climate change in the nation. Other factors include the extreme heat wave that hit Karachi in 2015, the effects of consecutive floods since 2010, the severe winds that hit Islamabad in June 2016, the rise in landslides and Glacial Lake Outburst Floods in the country's northern regions, and an increase in cyclonic activity.

According to Rosegrant et al. (2009), livestock accounts for 17% of global calorie consumption and 33% of protein consumption, demonstrating its contribution to food and nutritional security worldwide. Since animals are allocated more fairly than land, increasing livestock production may have a greater positive impact on reducing poverty as compared to crop output (Birthal et al., 2003). Meanwhile a large percentage of rural farm households rely on livestock for their livelihood and livestock income makes up a sizable portion of farm households' income portfolios in developing nations, climate change is predicted to have a substantial impact on over 600 million people who rely on livestock for their livelihood (Thornton, 2002).

Livestock products provide a substantial contribution to the food security of both rural and urban populations in South Asian nations such as China, Bangladesh, India, and Pakistan. Pakistan's rural economy depends heavily on livestock, which accounts for 11.4% of the country's total GDP and around 58.3% of agricultural value added (Government of Pakistan, 2018). Over 8 million people in Pakistan raise cattle, and they typically make over 35% of their income from this activity (Government of Pakistan, 2018).

According to the Government of Pakistan (2016/17), the livestock industry contributed around 1,333 billion rupees to the gross value addition, demonstrating the essential role that livestock may play in reducing poverty and boosting foreign currency earnings. It was observed that food safety in Pakistan is positively correlated with the amount of milk and animals per person and working animals per acre (Mahmood et al., 2014). Similarly Ali & Khan (2013) used the propensity score matching approach to calculate the potential impact of livestock ownership on the food security of individual households in Pakistan. The results showed that the level of food security was higher for households with livestock than for those without livestock.

Animals are a major source of income for many Pakistan's small farmers. According to Khan et al. (2019), livestock is also essential for supplying the basic food needs of many households. By keeping most consistent average growth rate of about 3%, livestock now accounts for a significant portion of the agriculture industry (60.6%) (Ministry of Finance Pakistan, 2020). Pakistan's agricultural GDP is positively and significantly correlated with the production of milk, fats, eggs, bones, and mutton (Rehman et al., 2017). The four most significant livestock species in Pakistan are cattle, buffalo, sheep, and goats. During the last three years, from 2018 to 2021, cattle and goats grew at greater rates than buffalo and sheep (Ministry of Finance, Pakistan, 2020).

According to Hussain et al. (2017), Pakistan is home to the second-largest buffalo population in the world, with over 60% of the nation's buffaloes living in Punjab province (Afzal, 2009). After buffalo, which accounts for 60.24 % of milk and its byproducts, cattle are the second most important animal in terms of output providing people with vital amino acids (Ministry of Finance Pakistan, 2020; Górska-Warsewicz et al., 2018).

Humans have relied on cattle for sustenance since the beginning of farming, yet there is still a significant supply and demand imbalance because of climate change effects, which results in food insecurity. Over 1.3 billion people rely on the cattle industry (World Bank, 2020). Acosta (2018) found that approximately 0.82 billion people worldwide and over 13% of individuals in developing countries suffer from severe malnutrition. Here is the description of how climate change in Pakistan impacts on livestock production.

### **Impact of Climate Change on Livestock**

Pakistan had ample water from the rivers that flowed through it, and its irrigation system was completely functional. However, in recent years, there has rarely been enough water to fulfill end customers' needs. The irrigation system was beginning to experience previously unheard-of strain due to population increase (UN, 2001). Droughts have a significant impact on livestock populations, and throughout the past ten years, particularly in 2003–04, their growth has decreased (SBP, 2003-04). According to Balochistani experts, the country has been plagued by drought, with the province of Balochistan being the most severely impacted and suffering fatalities (Shafiq & Kakar, 2007). These ideas were supported by a recent FAO (2012) study that detailed how the flood in the Sindh region killed 116,000 cattle heads. Floods have negatively impacted the nation in recent years, particularly in Punjab and Sindh, because of changes in precipitation patterns.

Extended drought lengthens the dry season for dairy cattle, which lowers milk production (Maurya, 2010). It is projected that roughly 64% of the world's population will experience water distress due to rising demand for water from competing sources and climatic change-induced depletion of water resources, which will ultimately result in less water available for the livestock industry (Rosegrant et al., 2009). Additionally, it is anticipated that animals would use more water because of the temperature increase (Nardone et al., 2010). Due to changes in the nutritional composition of the forage, climate change-induced heat stress also lowers livestock product output (Seerapu et al., 2015; Thornton et al., 2009).

In addition to causing a decline in cattle productivity, the changing climate also raises the incidence of livestock illnesses and mortality (Jones & Thornton, 2009; Thornton et al., 2009; Amin et al., 2010; Herrero et al., 2010; McDermott et al., 2010; Nardone et al., 2010; Rojas-Downing et al., 2017). Globally, cattle illnesses brought on by climate change are becoming more prevalent, endangering the food security, livelihood, and income of those residing in developing nations.

### **Impact of Climate Change on sources of Livestock Feed**

Climate change may have a significant impact on the amount and quality of animal feed. Fereja (2016) claims that patterns of high temperatures and humidity have a significant impact on the amount and quality of pasture, upsetting the global cattle food cycle. Global warming has been shown to have a significant impact on grass

nutrient levels (Nardone et al., 2010), which has a negative effect on cattle productivity (Hidosa & Guyo, 2017; Das, 2017).

According to several studies, extreme weather events like high temperatures have a detrimental effect on the cattle business by reducing crop quality and quantity. Crops including wheat, maize, rice, sugarcane, and many more may have lower amounts of proteins, carbs, and several other minerals and vitamins (Myers et al., 2014; Augustine et al., 2018).

## Conclusion and Recommendations

Climate change poses a serious threat to the entire planet because of its many facets and consequences on humans, animals, plants, and the ecosystem. According to previously published research, livestock health is impacted both directly and indirectly by changes in regional or global climatic patterns brought on by climate change. Therefore, it is highly advised that appropriate long-standing reworking strategies and extenuation options for the livestock sector be developed to manage climate change. It is also advised to create and implement a practical technique to connect climatic data with animal disease surveillance systems.

## References

- Afzal, M. (2009). Improving veterinary service in Pakistan. *Pakistan Veterinary Journal*, 29(4).
- Ali, A., & Khan, M. A. (2013). Livestock ownership in ensuring rural household food security in Pakistan. *Journal of Animal and Plant Sciences*, 23(1): 313-8.
- Amin, H., Ali, T., Ahmad, M., & Zafar, M. I. (2010). Gender and development: roles of rural women in livestock production in Pakistan. *Pakistan Journal of Agricultural Sciences*, 47(1), 32-36.
- Augustine, D. J., Blumenthal, D. M., Springer, T. L., LeCain, D. R., Gunter, S. A., & Derner, J. D. (2018). Elevated CO<sub>2</sub> induces substantial and persistent declines in forage quality irrespective of warming in mixedgrass prairie. *Ecological Applications*, 28(3), 721-735.
- Birthal, P. S., Deoghare, P. R., & Riyazuddin, S. K. (2003). Development of small ruminant sector in India. *Project report submitted to Indian Council of Agricultural Research (ICAR), New Delhi, India*.
- Acosta, A. (2018). World livestock: transforming the livestock sector through the sustainable development goals. In *World livestock: transforming the livestock sector through the Sustainable Development Goals*. Rome: Food and Agriculture Organization of the United Nations.
- FAO (2012). Executive Brief; Pakistan Flood 2011. [http://www.fao.org/fileadmin/templates/tc/tce/pdf/Executive\\_Briefs/24.01.12\\_Pakistan\\_Floods\\_FAOEB.pdf](http://www.fao.org/fileadmin/templates/tc/tce/pdf/Executive_Briefs/24.01.12_Pakistan_Floods_FAOEB.pdf)
- Fereja, G. B. (2016). The impacts of climate change on livestock production and productivity in developing countries: a review. *International Journal of Research-Granthaalayah*, 4(8), 181-7.
- Government of Pakistan (2016/17). Economic Survey of Pakistan. Ministry of Finance, Government of Pakistan, Islamabad, Pakistan. [http://www.finance.gov.pk/survey\\_1617.html](http://www.finance.gov.pk/survey_1617.html).
- Government of Pakistan (2018). Board of Investment, Prime Minister's Office, Government of Pakistan. Accessed from. <http://boi.gov.pk/Sector/SectorDetail.aspx?sid/41>. (Accessed 28 August 2018).
- Herrero, M., Thornton, P. K., Notenbaert, A. M., Wood, S., Msangi, S., Freeman, H. A., & Rosegrant, M. (2010). Smart investments in sustainable food production: revisiting mixed crop-livestock systems. *Science*, 327(5967), 822-825.
- Hidosa, D., & Guyo, M. (2017). Climate change effects on livestock feed resources: A review. *Journal of Fisheries & Livestock Production*, 5(4), 259.
- Hussain, T., Babar, M. E., Ali, A., Nadeem, A., Rehman, Z. U., Musthafa, M. M., & Marikar, F. M. (2017). Microsatellite based genetic variation among the buffalo breed populations in Pakistan. *Journal of veterinary research*, 61(4), 535.
- Jones, P. G., & Thornton, P. K. (2009). Croppers to livestock keepers: livelihood transitions to 2050 in Africa due to climate change. *Environmental Science & Policy*, 12(4), 427-437.
- Khan, K., Uthal, B., Xiangyu, G., & Bunnika, P. (2019). The Relationship between Livestock Income and Food Security: A Case Study of Jhal Magsi, Balochistan, Pakistan. [www. https://core.ac.uk/download/pdf/234683434.pdf](https://core.ac.uk/download/pdf/234683434.pdf) (assessed 20 June 2021).

- Mahmood, H. Z., Hussain, I., Iftikhar, S., Khan, M., & Nisa, F. R. (2014). Role of livestock in food security: an ascertainment from Punjab Pakistan. *International Journal of Academic Research in Business and Social Sciences*, 4, 458-470.
- Maplecroft (2010). Big economies of the future. <http://maplecroft-/;989.com/about/news/ccvi.html>
- Maurya, R. K. (2010). *Alternate dairy management practices in drought prone areas of Bundelkhand Region of UP* (Doctoral dissertation, IVRI, Izatnagar).
- McDermott, J. J., Staal, S. J., Freeman, H. A., Herrero, M., & Van de Steeg, J. A. (2010). Sustaining intensification of smallholder livestock systems in the tropics. *Livestock science*, 130(1-3), 95-109.
- Ministry of Finance (2020). Finance division, Economic advisor's wing, Government of Pakistan, Islamabad, Pakistan.
- Myers, S. S., Zanobetti, A., Kloog, I., Huybers, P., Leakey, A. D., Bloom, A. J., Carlisle, E., Dietterich, L. H., Fitzgerald, G., Hasegawa, T., Holbrook, N. M., & Usui, Y. (2014). Increasing CO<sub>2</sub> threatens human nutrition. *Nature*, 510(7503), 139-142.
- Nardone, A., Ronchi, B., Lacetera, N., Ranieri, M. S., & Bernabucci, U. (2010). Effects of climate change on animal production and sustainability of livestock systems. *Livestock science*, 130(1-3), 57-69.
- Rehman, A., Jingdong, L., Chandio, A. A., & Hussain, I. (2017). Livestock production and population census in Pakistan: Determining their relationship with agricultural GDP using econometric analysis. *Information Processing in Agriculture*, 4(2), 168-177.
- Rojas-Downing, M. M., Nejadhashemi, A. P., Harrigan, T., & Woznicki, S. A. (2017). Climate change and livestock: Impacts, adaptation, and mitigation. *Climate risk management*, 16, 145-163.
- Rosegrant, M. W., Fernández, M. A. R. I. A., Sinha, A. N. U. S. H. R. E. E., Alder, J. A. C. K. I. E., Ahammad, H., Fraiture, C. D., & Yana-Shapiro, H. (2009). Looking into the future for agriculture and AKST.
- Das, S. (2017). Impact of climate change on livestock, various adaptive and mitigative measures for sustainable livestock production. *Approaches Poultry and Dairy & Veterinary Sciences*, 1, 64-70. <https://doi.org/10.31031/APDV.2017.01.000517>
- SBP (2003-04). Annual Report. State Bank of Pakistan, Islamabad.
- Seerapu, S. R., Kancharana, A. R., Chappidi, V. S., & Bandi, E. R. (2015). Effect of microclimate alteration on milk production and composition in Murrah buffaloes. *Veterinary world*, 8(12), 1444.
- Shafiq, M., & Kakar, M. A. (2007). Effects of drought on livestock sector in Balochistan Province of Pakistan. *International Journal of Agriculture and Biology (Pakistan)*, 9(4), 657-665.
- Thornton, P. K., van de Steeg, J., Notenbaert, A., & Herrero, M. (2009). The impacts of climate change on livestock and livestock systems in developing countries: A review of what we know and what we need to know. *Agricultural systems*, 101(3), 113-127.
- Thornton, P., Kruska, R., Henninger, N., Kristjanson, P., Reid, R., Atieno, F., Odera, A., Ndegwa, T., 2002. Mapping Poverty and Livestock in the Developing World. International Livestock Research Institute (ILRI), PO Box 30709, Nairobi, Kenya.
- Thornton, P. (2002). *Mapping poverty and livestock in the developing world* (Vol. 1). ILRI (aka ILCA and ILRAD).
- UN (2001). Resident Coordinator of the UN Systems' Operational Activities for Development in Pakistan. Drought update # 13.
- Górska-Warsewicz, H., Laskowski, W., Kulykovets, O., Kudlińska-Chylak, A., Czczotko, M., & Rejman, K. (2018). Food products as sources of protein and amino acids—The case of Poland. *Nutrients*, 10(12), 1977.
- World Bank (November 19, 2020). Moving towards sustainability: The Livestock Sector and the World Bank. Washington, DC: World Bank. Available at <https://www.worldbank.org/en/topic/agriculture/brief/moving-towards-sustainability-the-livestock-sector-and-the-world-bank>.