



The Impact of Changes in the Temperature on Water, Soil and Food Systems in India

Session Partner: M S Swaminathan Research Foundation

Background:

Of the different variations of climate change, rising temperature is emerging as a crucial factor influencing agricultural production, associated natural resources, especially soil and water and farmers' lives. Several studies predicted a rise in temperature across several states. The long-term analysis of temperature between 1901-2018 has shown an average increase of 0.7°C. The IPCC 2022 report highlighted the near-term, mid-term and long-term risks of the global temperature rising above the level of 1.5 °C in several models of scientific predictions. The study of Chaturvedi et al. (2012) predicted an increase in temperature of 3.19°C under the A1 B scenario (based on CMIP3 model ensemble mean) and 2.8°C and 4.3°C under the RCP6.0 and RCP8.5 scenarios respectively in the 2080s when compared to the 1970s baseline (based on CMIP5 model ensemble mean)ⁱ.

The increased temperature has adverse impacts on the food security of the country. Numerous studies have pointed out the risk of reduction in crop productivity under elevated temperatures. Aggarwal (2008) has predicted a probable crop loss to the tune of 10% to 40% in the country by 2080-2100 due to global warmingⁱⁱ. Similarly, in the agriculture sector, temperature rise, enhance the crop water demand, which needs more water for irrigationⁱⁱⁱ. This led to the over-exploitation of groundwater resources. Apart from demand dimensions, it seems that there is a challenge on the supply side. It is evident from the study of Saha et al. (2014) that the Indian summer monsoon has weakened from the latter half of the 20th century, a crucial and main source of water for agriculture in India^{iv}. The increase in the soil temperature negatively impacts soil organic matter, leading to soil erosion, reduction in water and nutrient holding capacity and ultimately leads to reduced crop productivity.

As a mitigation action, since 2013, the Government of India started developing an operational heat action plan and as of now, NDMA and IMD have been working with 23 states that are prone to high temperatures. However, there are gaps in appropriate adaptation measures to the temperature extremities in agriculture. Although farmers are slowly moving towards incremental adaptation measures, their capacity to adapt 'systemic' and 'transformational' adaptation are to be explored and design relevant strategies.

ⁱ <https://currentscience.ac.in/Volumes/103/07/0791.pdf>

ⁱⁱ <http://indiaenvironmentportal.org.in/files/Global%20Climate%20Change.pdf>

ⁱⁱⁱ https://link.springer.com/chapter/10.1007/978-81-322-2157-9_1

^{iv} <https://agupubs.onlinelibrary.wiley.com/doi/pdfdirect/10.1002/2014GL061573>