



## Climate Change in Agriculture

**Kunal Narwal<sup>1\*</sup>, Rahul  
Sharma<sup>1</sup>, Bharat Bhushan  
Rana<sup>1</sup> and Ankit Gill<sup>2</sup>**

<sup>1</sup>Phd scholar, Dept. of  
Agronomy CSK Himachal  
Pradesh Agriculture University,  
Palampur

<sup>2</sup>Phd scholar, Dept. of Soil  
Science CCS Haryana  
Agricultural University, Hisar



\*Corresponding Author

**Kunal Narwal\***

### Article History

Received: 23. 10.2022

Revised: 3. 11.2022

Accepted: 8. 11.2022

This article is published under the  
terms of the [Creative Commons  
Attribution License 4.0.](https://creativecommons.org/licenses/by/4.0/)

### INTRODUCTION

Climate has a direct impact on agricultural production. The totality of the local weather as measured by long-term statistics of meteorological factors is referred to as the climate. These factors, which are crucial for the growth, development, and productivity of plants and, consequently, the welfare of humans, include temperature, wind, precipitation, and daylight hours. Climate change has had a tremendous impact on the natural and human ecology in recent decades.

Agriculture is a major driver of climate change. The meat, dairy and poultry industries are responsible for a majority of food-related greenhouse gas emissions. In fact, agriculture accounts for about one-third of all human-caused greenhouse gas emissions worldwide.

Due to drought, heat waves, flooding, an increase in pests and plant diseases, and decreased food yields and nutritional quality, climate change's effects on agriculture may reduce crop yields. Farmers and farming communities around the world will face additional difficulties as our climate continues to change and its effects become more frequent and severe. In actuality, the industrial agriculture model that predominates in our country—a model that disregards soils, diminishes diversity, and places an undue emphasis on fertilisers and pesticides.

Increasing temperatures, heat waves, and changes in rainfall are direct effects of altering weather patterns (including droughts and floods). There are also direct effects of rising atmospheric CO<sub>2</sub> levels, including higher crop yields brought on by CO<sub>2</sub> fertilisation but decreasing nutrient value of crops (lower levels of micronutrients). Pests, plant diseases, and weeds will change due to the climate, which can also lead to poorer yields. The loss of agricultural land owing to sea level rise and, on the other hand, more arable land due to less frozen terrain is further indirect effects of the altered conditions.

Due to the melting of the glaciers, there will also be less irrigation water available. Additionally, there will be repercussions on soil fertility and erosion, changes in growing seasons, food safety and losses (induced by bacteria like Salmonella and fungus that produce mycotoxins) and additional financial burdens. Agriculture can be significantly impacted by water scarcity, including changes in terrestrial precipitation, evaporation, and soil moisture, which are brought by or exacerbated by climate change.

**How climate change will challenge farmers**

**Changing patterns of precipitation: -**

Across the nation, rainfall patterns are already changing, and these changes are predicted to get worse over the next few years. Even within the same regions, this is likely to result in prolonged dry spells and more severe heavy rainstorms.

**Varying patterns of temperature: -**

Farmers in all locations will probably be impacted by rising average temperatures, more intense heat all year long, fewer days with enough cooling during the winter, and more frequent thaws throughout the cold season.

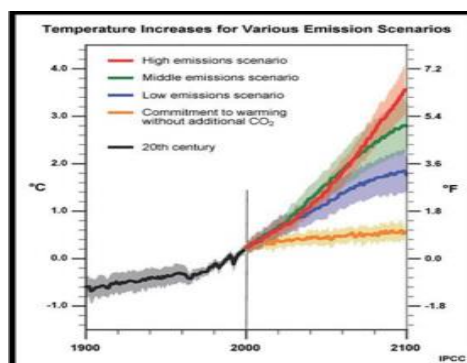
**Climate change impacts**

- I. Floods. Many agricultural areas of the nation, notably the Midwest, the Southern Plains, and California, have already experienced a rise in flooding. The frequency and severity of floods on farms in coastal areas are also increasing because of sea level rise.

These expensive floods destroy cattle and crops, hasten soil erosion, contaminate water supplies, and harm schools, bridges, highways, and other infrastructure.

- II. Droughts. Just as harmful, as too much water is too little. Over the past ten years, severe droughts have had a devastating impact on crops, livestock, and farmers in many regions of the country, most notably California, the Great Plains, and the Midwest. According to science, these droughts will likely get worse as global temperatures rise, depleting water supplies and, in some cases, igniting destructive wildfires.
- III. Changes in the viability of crops and livestock. Farmers select crop kinds and animal breeds that are compatible with the environment where they are raised. Many farmers may be compelled to reconsider some of their decisions when those conditions rapidly change over the ensuing decades; this may entail making new financial investments, discovering new markets, and picking up new techniques.
- IV. New issues with diseases, weeds, and pests. Farmers will need to adapt to new risks just as they will need to find new crops, livestock, and farming techniques.

**GLOBAL SCENARIO OF CLIMATE CHANGE**



Source: IPCC, 2007.

## How Climate Change Is Impacting India's Food Security

One of the main issues raised by climate change is food security. Food security is impacted by climate change in a variety of ways. Reduced incomes, weakened livelihoods, disrupted trade, and negative health impacts are few of the serious social and economic effects it can have on crops,

cattle, forests, fisheries, and aquaculture. It is crucial to remember that the true effects of climate change rely on both the underlying vulnerabilities and the magnitude of the climatic shock. According to the FAO (2016) the net effect of climate change on food security is determined by both biophysical and social vulnerabilities.



### Food production

Climate change adds to India's long-term food security challenges as it has numerous effects on food production. For example, it might result in significantly greater inter- and intra-seasonal variability of monsoon rainfall. According to World Bank projections, for a global mean warming of 4°C, there will be a 10% increase in annual mean monsoon intensity and a 15% increase in year-to-year variability in monsoon precipitation based on the International Energy Agency's current policy scenario and other energy sector economic models. The World Bank (2013) also predicts that while southern India will see an increase in wetness, droughts will pose an increasing concern in the country's north-western region.

### Food access

The economic factors that cause food insecurity are intensified by climate change.

The anthropogenic global warming expansion of the agricultural growing season, increased frequency of extreme events, and the resulting decrease in yield have a negative impact on the farmer's net income. India is particularly vulnerable due to the small and marginal farmers that live in rural areas and rely on rain-fed monocropping, which only supplies a few months of food security in a typical year.

The Global Food Policy Report 2022 predicts that due to lower agricultural output and interruptions in the food supply chain, climate change may result in widespread famine in India by 2030. One of the most significant impacts of climate change will be on our food chain. It affects how we both produce and consume food. India, whose economy is predominately agrarian, is particularly impacted, with effects observed throughout the entire food supply chain. On

Sunday, temperatures in several parts of northern India surpassed 49 degrees Celsius, making it one of the warmest days in recent memory. The continuing heatwave has damaged agricultural and food security in numerous ways. It severely impacted the wheat crop, had a negative effect on the food supply, and drastically increased the price of wheat-based items.

### CONCLUSION

There are numerous possible effects of climate change on agricultural output, but it is unclear how they will all interact. This is especially true at the global level, where it is difficult to reliably quantify many of these effects. Although a rise in the average temperature may be confidently predicted, the effects on production may be more influenced by the frequency and severity of high temperatures. Agricultural land may eventually be lost due to persistent inundation caused by mean sea-level rise, but the effects of brief flooding from storm surges may be significant even though they are less predicted. Due to the reliance on rivers nourished by precipitation, snowfall, and glaciers located far away, agricultural impacts in some places may result from climate changes in other regions. Increased water usage efficiency by plants under increasing CO<sub>2</sub> concentrations may also help to mitigate drought, though the effects of this are unclear, especially at large scales. Although most agricultural areas are anticipated to see an increase in the amount of time spent in drought as measured by soil

moisture, the climate models employed here project an increase in annual mean soil moisture availability and runoff in many locations. Furthermore, crop production forecasts are even questionable because they heavily depend on how strong the CO<sub>2</sub> fertilisation and O<sub>3</sub> damage are. Model projections are not well limited since few studies have evaluated how crop yields respond to CO<sub>2</sub> fertilisation and O<sub>3</sub> pollution under real-world growth circumstances. Local studies of the indirect effects of climate change on pests and illnesses have not yet been translated into a worldwide assessment. Overall, it doesn't seem possible to make a thorough assessment of the effects of human climate change on global agricultural productivity at this time.

### REFERENCES

- Gitz, V., Meybeck, A., Lipper, L., Young, C. D., & Braatz, S. (2016). Climate change and food security: risks and responses. *Food and Agriculture Organization of the United Nations (FAO) Report, 110*, 2-4.
- Turn Down the Heat: climate Extremes, regional impacts, and the case for resilience”, World Bank, 2013.
- Raj, S., Roodbar, S., Brinkley, C., & Wolfe, D. W. (2022). Food Security and Climate Change: Differences in impacts and adaptation strategies for rural communities in the Global South and North. *Frontiers in Sustainable Food Systems, 5*.