



## **Impact of climate change on agriculture**

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### **Abstract**

Climate change is a significant global issue today, marked by major shifts in meteorological elements like precipitation and temperature over long periods. Increasing temperatures, changing precipitation patterns, and more frequent extreme weather events can reduce crop yields, degrade soil, and cause water shortages. The global temperature is expected to rise by 2°C by 2100, leading to considerable economic impacts. For example, higher temperatures can speed up crop maturation, lowering yields, while unpredictable rainfall can cause droughts or floods, stressing crops further. Farmers can adapt by using climate-resilient crops, adjusting planting schedules, and improving water management. Soil conservation and crop diversification can also boost resilience. By adopting these strategies, farmers can better handle climate uncertainties, sustain agricultural productivity, and support global food security.

### **1. Introduction**

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a long-term alteration in climate state, evident through changes in its variability or average properties. This encompasses shifts in weather patterns, temperatures, and extreme events such as floods, heatwaves, wildfires, habitat destruction, intense storms, and desertification. While climate change can result from natural variability, human activities, particularly fossil fuel combustion since the 1800s, have become the primary driver. Climate action failure and extreme weather are ranked as the top two global risks for the next decade (McLennan 2022). Climate change may affect agriculture at both local and regional scales. Changing climate impacts agriculture by altering growing conditions, increasing the need for irrigation, and raising

wildfire. Changes in temperature and rainfall are likely to increase the spread of insects, weeds, and diseases, leading to a greater need for control measures (Ziska *et al.*, 2016). It affects soil and water resources through erosion, nutrient depletion, and hypoxia in aquatic systems, while sea level rise threatens coastal farmland. Additionally, agricultural workers and livestock face health risks from heat, pesticide exposure, and degraded air quality. Farmers can adapt to climate change by adopting resilient crop varieties and improving water management practices. They can also implement soil conservation techniques and diversify their crops to enhance resilience. Seven of the 17 Sustainable Development Goals focus on agriculture and climate change. To achieve these goals and tackle climate issues, climate-smart agriculture is essential. This approach promotes sustainable food production, climate adaptation, and resilience (FAO, 2010).

## **2. Impact on agriculture**

The impact of climate change on agriculture is profound and multifaceted, affecting various aspects of farming and food production. Some of the main challenges are:

### **2.1 Crop yields**

Temperature changes affect crop yields based on the ideal growth conditions for each crop. Warmer temperatures may benefit some crops or allow for new ones, but prolonged heatwaves stress plants, leads to reduced photosynthesis, lower yields, and poor grain development. Additionally, higher temperatures can reduce plant's ability to access and use moisture effectively.

### **2.2 Pollination**

Warmer temperatures and shifting precipitation patterns can disrupt the timing of plant blooming and pollinator activity, such as bees and butterflies. If these timings don't align, it can lead to reduced pollination.

### **2.3 Pests and diseases**

Higher temperatures can lead to more frequent outbreaks of pests and diseases, affecting crop health and yields. This means farmers will need more effort and resources to control these pests and manage weeds, potentially increasing costs and complexity.

## **2.4 Altered Precipitation Patterns**

Increased frequency and severity of droughts lead to water shortages, impacting irrigation and reducing crop productivity. Heavy rainfall and floods can damage crops, erode soil, and disrupt planting and harvesting schedules.

## **2.5 Soil Degradation**

Extreme weather and altered rainfall patterns contribute to soil erosion, depleting soil nutrients and affecting crop productivity. Rising sea levels and increased evaporation can lead to soil salinization, making land less productive.

## **2.6 Fodder quality and livestock productivity**

Higher temperatures and altered feed availability can impact livestock health, productivity, and reproduction rates. High carbon dioxide levels can lower the quality of fodder by decreasing its protein, iron, zinc, and vitamins B1, B2, B5, and B9 content ([Ebi and Loladze, 2019](#)).

## **2.7 Economic Impact**

Farmers may face higher costs for irrigation, pest control, and adaptation measures. These costs can reduce profitability and economic stability.

## **3. Adaptation strategies**

Different approaches and practices for sustainable crop production can contribute to climate change adaptation.

**Resilient Crops:** Selecting climate-resistant varieties helps maintain productivity.

**Land Preparation:** Proper techniques boost soil health and water retention.

**Conservation Agriculture:** Minimal tillage and soil cover prevent erosion and protect soil.

**Cropping Schedules:** Adjusting planting and harvest times aligns with weather changes.

**Crop Diversification:** Growing multiple crops reduces risk and enhances resilience.

**Water Management:** Practices like drip irrigation ensure a stable water supply.



**Nutrient Management:** Combining organic and inorganic fertilizer enhances soil fertility and crop resilience.

**Laser Land Levelling:** Ensures uniform water distribution, reducing water wastage and improving crop growth.

**Protected Agriculture:** Greenhouses and shade nets protect crops from extreme conditions.

#### **4. Conclusion**

Climate change significantly impacts agriculture by altering temperature, precipitation patterns, and increasing extreme weather events, which threaten crop yields, soil health, and water resources. Adopting adaptation strategies, such as selecting resilient crops, optimizing land and water management, and diversifying crops, is crucial for maintaining agricultural productivity and resilience. Implementing these strategies can help farmers better cope with the uncertainties of a changing climate and ensure sustainable food production.

#### **References**

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