


# Chapter 1

# Climate–Responsive Pest Management Strategies and Challenges

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## ABSTRACT

*Global agriculture is facing a severe risk owing to climate change, which is bringing about changes in temperature, precipitation patterns, and the frequency of extreme weather events. The dynamics of agricultural pests also change quickly along with these environmental conditions, posing serious threats to global food security. The idea of climate-responsive pest management has arisen in response to this complex interplay, with the goal of creating adaptive solutions that provide resilient*

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*and sustainable agricultural practices while navigating the changing environment Therefore, in order to ensure food security and environmental sustainability for future generations, the agricultural sector must negotiate the challenges posed by a changing climate by comprehending the complex interaction between pest dynamics and climate change and implementing climate-smart measures.*

## **INTRODUCTION**

The frequency and severity of localized agricultural pest outbreaks may rise due to predicted climate change (Kukul & Irmak, 2018). Therefore, industry and government entities tasked with overseeing agricultural pest management regulations must continue to value pest control significantly (Du et al., 2022). The sector keeps looking for ways to reduce the expenses related to pest infestations and management. However, the authorities aim to balance the goals of pest management and any possible negative externalities on the environment or public health (Du et al., 2022). We refer to this as “climate-smart pest management,” which calls for updated regulations, new methods of analytical thought, and pest management techniques.

The United Nations defines climate change as the continuous alterations in temperatures and weather patterns. The primary source of climate change is still human activity, mainly because of humans' involvement in gas emissions like CO<sub>2</sub> and methane, even though natural occurrences like oscillations in the solar cycle may bring about these changes (Bouri et al., 2023). The most recent IPCC assessment states that compared to the 1850–1900 time frame, which approximates preindustrial temperatures, global temperatures have already augmented by around 1.1 °C due to GHG emissions (Bouri et al., 2023). All areas of the earth will be impacted by this rise in global temperature, which is predicted to range 1.5 °C during the next few decades. Global warming is causing several environmental changes on Earth, including severe heat waves, wildfires, droughts, heavy rainfall, increasing sea levels, receding ice sheets and glaciers, changes in marine and freshwater life, etc. (Bouri et al., 2023). The adverse influences of climate alteration on crop produce that have been reported have also grown. For instance, crops most negatively impacted by climate change are maize and soybeans, whose yields have reduced by 10.8% and -16.7%, respectively (Porter et al., 2019). As a result, both the quality and quantity of food may be altered by climate change worldwide.

Global temperature and precipitation patterns are altering due to climate modification, and there will be more intense and unpredictable weather events (Heeb et al., 2019). Climate variation is already recognized to impact worldwide crop yields significantly and expected to do so in the upcoming years (Challinor et al., 2014). However, climate change also affects crop pests, defined as “any species, strain, or

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