Food and Agriculture Organization of the United Nations

International Plant Protection Convention

Plant health and climate change

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Key messages

- Climate change weakens our ecosystems and may support pest and disease dispersal and incidence.
- Alterations in weather conditions may lead to biological changes in pests and diseases, and also impact plant physiology and structure, which may increase vulnerability of plants towards pests and diseases.
- Increased pest and disease risks, degrading ecosystems and water scarcity can affect food security and livelihoods and contribute to economic crises, forced migration and conflicts.
- Implementing international standards for phytosanitary measures helps countries to prevent the introduction and spread of harmful pests and to preserve biodiversity.
- Preserving biodiversity helps to improve plant resilience and mitigate the impact of climate change on plant health.

Climate change has an impact on pests, pathogens and plant physiology

Plants are the source of the air we breathe and most of the food we eat. The Food and Agriculture Organization of the United Nations (FAO) estimates that between 20 and 40 percent of the global crop yields are reduced each year due to the damage caused by plant pests and diseases. Global yield losses of major staple crops such as wheat, rice and maize are projected to increase by 10 to 25 percent per degree of global average surface warming. Crop losses will be most severe in areas where warming accelerates plant pest and disease population growth and their metabolic rates.

Climate change affects all four dimensions of food security: food availability, food accessibility, food utilization and food systems stability. People who are already in a vulnerable position and food insecure are likely to be the first affected by increased crop failure and new patterns of pests and diseases.

The life cycle, epidemiological characteristics and spread of plant pests and diseases are determined by climatic factors such as solar radiation, temperature and rainfall. Slow onset events such as increasing temperature are usually easier to predict than rapid onset events such as shifts in rainfall patterns. Global warming and extreme changes in weather events will likely affect the life cycle, epidemiological characteristics and spread of plant pests and diseases. Rising temperatures may for instance increase the fertility of pests, and thus accelerate their population development and threaten food security. Global warming also allows pests to better survive winters and may thus reduce pest dormancy. In addition, changes in wind patterns may affect the distribution of pests; for instance, hurricanes and other extreme weather events can disperse pests and diseases more widely.

On the other hand, pests and diseases can contribute to climate change by causing tree mortality, which may consequently reduce net carbon sinks, since trees can either sequester carbon or release it into the atmosphere.

Increased carbon dioxide and ozone levels in the atmosphere and intensified rainfall may also have an impact on plant physiology and structure, which could lead to a greater plant vulnerability towards pests and diseases. Rising temperatures may cause breakdown of resistance mechanisms in plants and increase their lignification, i.e. hardening of the cell walls, which can reduce possibilities to process the plant biomass in food production. Storms and increased amount of rainfall may weaken plants and cause an increased fungal and bacterial infectivity. The increased virulence of plant diseases may enlarge the geographical range within which pests spread. In the case of droughts, stressed plants risk losing their natural ability to resist pests and diseases.

Climate change also increases the risk of pests and diseases to find favourable climate conditions in areas previously uninhabitable to them and consequently spread to these areas. Newly introduced crops may further facilitate the pest and disease distribution in such areas. The impacts of pests

and diseases may even be boosted if their interactions with prevalent hosts lack resistance mechanisms developed in their area of origin through coevolution. Increased focus on analyzing the impact of climate change when conducting pest risk analysis can therefore help to protect plant health, biodiversity and food security.

In response to the increased spread of plant pests, the global use and demand of some potentially harmful synthetic toxic agrochemicals might proliferate with negative consequences for plant health, human health, biodiversity and the environment. Agricultural and forestry activities may require shifts in plant breeding and modifications in pest control practices in order to adapt to climate change, which demand renewed technical know-how, in particular with regard to prevention of the international spread of pests and diseases and the disciplines to surveil pest occurrence.

Lack of genetic diversity makes plants more vulnerable to climate change

Climate change may increase genetic erosion, and the lack of genetic diversity in crop production is a risk for plant health. Plant genetic diversity provides an important reservoir of heritable traits that can help crop production systems to better adapt to climate change, and reduce the need for external outputs, such as certain hazardous pesticides or fertilizers, that may cause damage to the environment. Besides domesticated plants, climate change can also affect the ability of many crop wild relatives to survive in their current locations. Therefore, promoting the conservation, exchange and use of plant biodiversity across the globe is crucial to ensure crop resilience and adaptation to climate change. It is important to always ensure that plants and plant products meet phytosanitary requirements when they move across borders.

Climate change threatens the safe trade of plant products

Trade offers a way to resolve climate-change-induced food shortages regionally, but international trade also provides a pathway for plant pests and pest vectors to spread into new, warmer areas of the world that were previously not hospitable to them.

Increased plant pests may cause significant economic losses and reduce yields and the quality of the harvest, thus resulting in potentially considerable food losses. Countries should consider the implementation and enforcement of sanitary and phytosanitary measures to achieve the benefits of safe international trade in plants and plant products.

Fall armyworm's geographical distribution is dependent on climatic conditions. It is adapted to a warm climate; raising temperatures can facilitate its dispersal to new areas.

The International Plant Protection Convention (IPPC) community's response to mitigating the impact of climate change on plant health

The IPPC Strategic Framework 2020–2030 includes assessing and managing the impact of climate change on plant health as one of the eight development agenda items that the global plant health community seeks to achieve over the current decade. In specific terms, the Strategic Framework aims at having regular assessments of the impact of climate change on plant health and the safe trade of plants and plant products, especially in relation to pest risk analysis and management issues. The other major goal is that phytosanitary issues are adequately reflected in the international climate change debate, especially under the Intergovernmental Panel on Climate Change.

The Commission on Phytosanitary Measures (CPM-15) established in April 2021 the Focus Group on Climate Change and Phytosanitary Issues to coordinate the development agenda item "Assessment and management of climate change impact on plant health", designing and managing the implementation of an action plan over the next four years (2022-2025).

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