SLU GLOBAL

Policy brief

Healthy harvests in a changing climate

How to enable climate-resilient sustainable pest management for smallholder farmers

According to FAO (The Food and Agriculture Organization of the United Nations) between 20 and 40 percent of crop production are lost before harvest due to pests. Sustainable pest management to protect plant health is crucial to secure crop yield and to decrease the use of harmful pesticides. Sustainable pest management takes advantage of interactions between natural organisms in the agricultural ecosystem, together with other nature-based solutions to control pests. Climate change impacts both the possibilities to benefit from such nature-based solutions and the risk for pest outbreaks. Development of 'climate smart' pest management enables a more resilient sustainable pest control.

Nature-based solutions for plant health

Crop pests (herbivores, pathogens and weeds) cause severe yield losses in low-income countries with large consequences for both food security and smallholder livelihoods. The need to control agricultural pests is thus urgent. Pest management is often based on synthetic pesticides that have adverse impact on both biodiversity and human health, with the largest effects on humans in low-income countries. It is therefore crucial to develop efficient and sustainable pest management that minimises the use of synthetic pesticides.

KEY MESSAGES

- Climate changes affect crops, pests and beneficial organisms and they may respond with e.g. altered population growth, geographic ranges or stress tolerance.
- Climate change could additionally destroy sustainable pest management if pests benefit from climate changes, but crops and beneficial organisms are negatively affected.
- Increased ecological understanding is needed to increase our ability to predict pest outbreaks and to develop sustainable pest management that is efficient under climate change.
- Climate-smart pest management strategies can be co-created by researchers, farmers and extension services by integrating ecological knowledge of climate change impacts with practical experience.
- Extension services and decision support tools need to integrate knowledge on climate change impacts on pest management in their work. Partnerships with farmers' associations and field schools could be useful.

Sustainable pest management often uses nature-based solutions. One example is intercropping of different plant species. *Photo: Marysellah Nelima.*

Climate change threatens plant health and food security

Climate change leads to altered patterns and unpredictability in key climatic variables like precipitation and temperature. Such alteration threatens the efficiency and reliability of pest management if they have positive effects on pests and negative effects on crops and beneficial organisms in the agricultural ecosystem.

Four areas in how pests, crops and beneficial organisms respond to climate change are especially important to consider for sustainable pest management:

1. Climate change may affect population growth and geographic range of pests.

2. Altered climatic conditions may stress crops and as a consequence reduce their resistance and tolerance against pests.

3. Efficiency of biological control organisms may decrease if the control organism is negatively affected and the pest positively affected by climate change.

4. Other sustainable management options such as habitat manipulation and biopesticides could be affected by climate change.

There is therefore a need of better ecological understanding of how organisms within the agro-ecosystem respond to climate change and how to mitigate the negative effects this could have on sustainable pest management. Sustainable pest management often harnesses or deploys nature-based solutions within the agricultural ecosystem to control pests.

Examples of sustainable pest management that harness nature-based solutions:

1. The development and use of **resistant and tolerant crop varieties**.

2. The **biological control** of pests by their natural enemies.

3. **Habitat manipulation**, such as intercropping, for pest deterrence and weed suppression.

4. The use of **biopesticides** such as plant- and microbially-derived compounds.

5. Exploitation of **semiochemicals** (i.e., the chemical signals used by pests) for pest monitoring and trapping.

Participatory approaches to enable climate-smart pest management

'Climate-smart' approaches to pest management build on an in-depth understanding of how climate change impacts species in the agricultural ecosystem. Adoption

Pests (pathogens, insects and weeds) lead to large yield loss annually and it is crucial to control them in a sustainable manner. *Photo: Laura Grenville-Briggs Didymus.*

of climate-smart pest management can thereby help to decrease farmer dependence on synthetic pesticides and enable a reliable yield that will improve human health through safe and nutritious food under climate change (Figure 1).

To facilitate the development of climate-smart pest management, researchers, farmers and extension services could work together to understand how climate change impacts local species interactions and to co-create sustainable methods that are compatible with farmer's knowledge and the local agricultural ecosystem.

Advisory services and decision support tools need to take climate change effects into account and support farmers in navigating among management options. Partnerships with farmers' associations and field schools are useful to increase awareness of ecology and climate change resilient sustainable pest management. Special support should be given to improve gender equality and to young farmers to implement sustainable pest management for the future.

Decision makers could distribute resources to increasing the ecological understanding and to platforms for knowledge sharing and cooperation between researchers, farmers and other stakeholders.

Way forward

To ensure healthy harvests under climate change we need to develop sustainable pest management that considers how interactions between crops, pests and beneficial organisms are affected by climate change. This is best done in partnership between diverse stakeholders, such as researchers, farmers and advisory services, to utilise both scientific expertise and practical knowledge of the local agro-ecosystem. Developing and implementing climate-smart pest management will allow resilient and sustainable pest management also in a changing climate and thus contribute to food security and food safety in unpredictable times. ■

Climate changes affect crops, pests and beneficial organisms and could have a negative impact on pest management that use nature-based solutions. *Photo: Pixabay, CC0.*

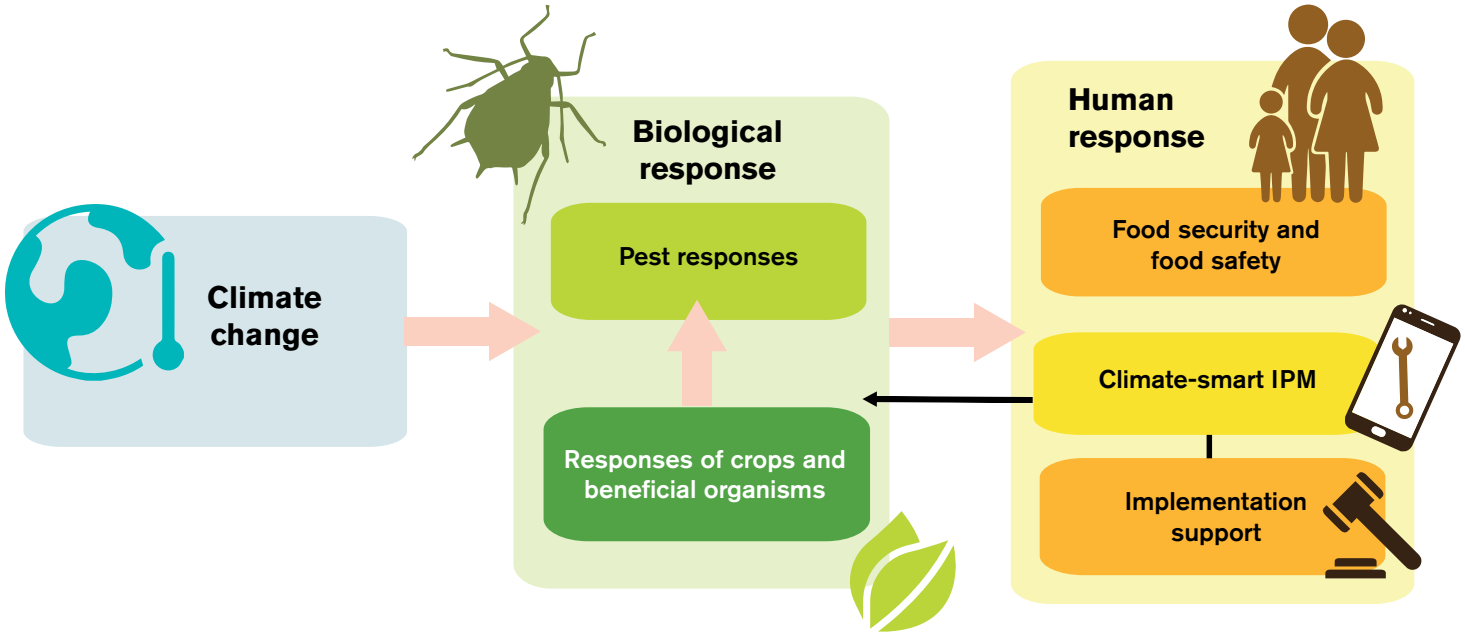

Figure 1. Overview of links between climate change, pests, and human responses. Climate change will trigger biological responses for both pests, crops and beneficial organisms. These responses could either be advantageous or disadvantageous for food safety and security, depending on whether the organisms are positively or negatively affected. By understanding these ecological effects scientists and farmers could co-create resilient pest management. This will ensure safe and nutritious food also during climate changes. Decision makers could advance the development by committing resources to increased ecological knowledge, technology and policy development. *Illustration: Cajsa Lithell, modified from Egan & Chikoye (eds.) et al 2021.*

Read more

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By understanding how climate changes affect species interactions we can develop climate-smart pest management that is efficient also during altered climatic conditions. *Photo: Ian Alexander, Wikimedia Commons*

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Authors and contact

Kristina Karlsson Green and Paul A. Egan
Researchers at the Department of Plant Protection Biology, SLU

kristina.karlsson.green@slu.se
paul.egan@slu.se

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> *Developing and implementing climate-smart pest management will allow resilient and sustainable pest management also in a changing climate and thus contribute to food security and food safety in unpredictable times.*

SLU Global

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