Impacts of Climate Change on Plant Health

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“There is no peace without tackling food security and eliminating hunger and there will be no food without tackling climate change.”

José Graziano da Silva, 2017

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"By 2050 the world's population will reach 9.1 billion, 34 percent higher than today. Nearly all of this population increase will occur in developing countries."
"In order to feed this larger, more urban and richer population, food production (net of food used for biofuels) must increase by 70 percent."

FAO, 2009

"For the major crops (wheat, rice, and maize) in tropical and temperate regions, climate change without adaptation will negatively impact production ….."

IPCC, 2014

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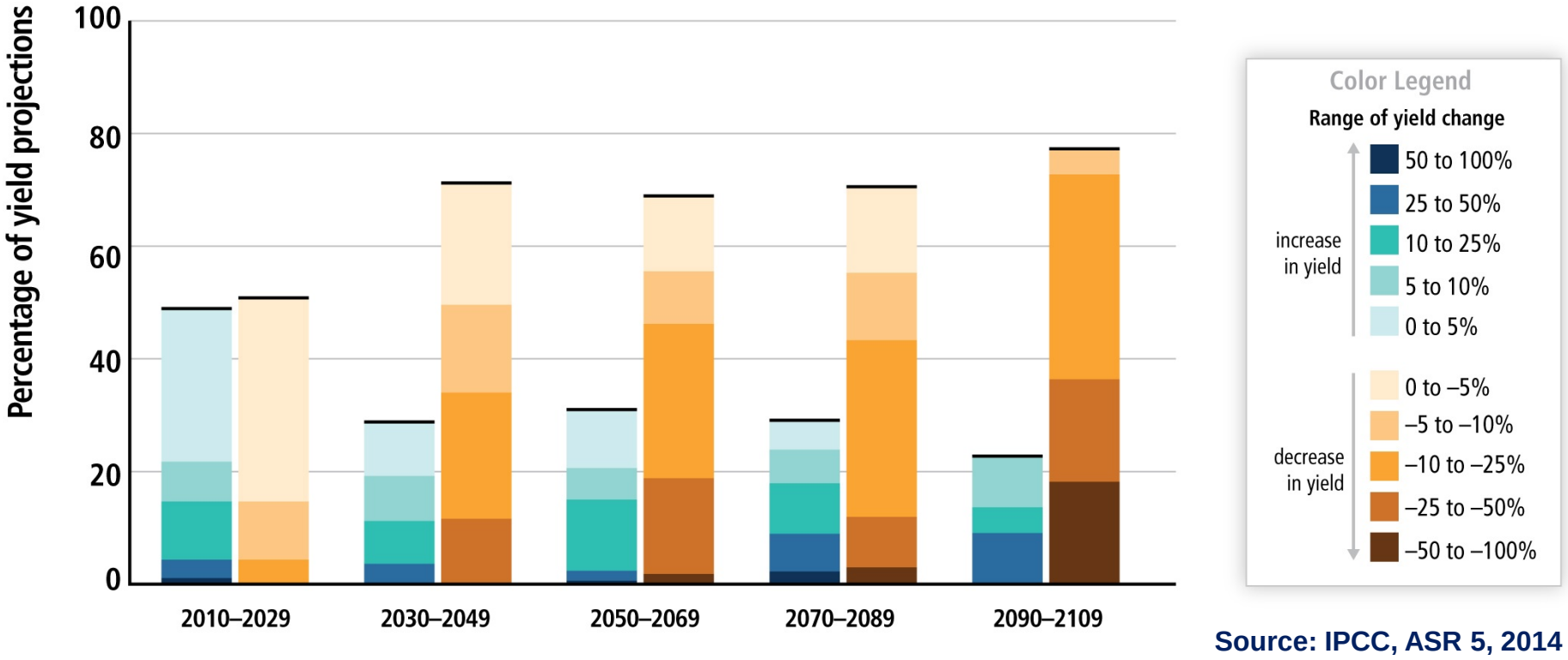
Summary of predicted changes in crop yields



Source: IPCC, ASR 5, 2014

However, many yield projections do not consider biotic factors such as climate change-induced pest, diseases and weed impacts.

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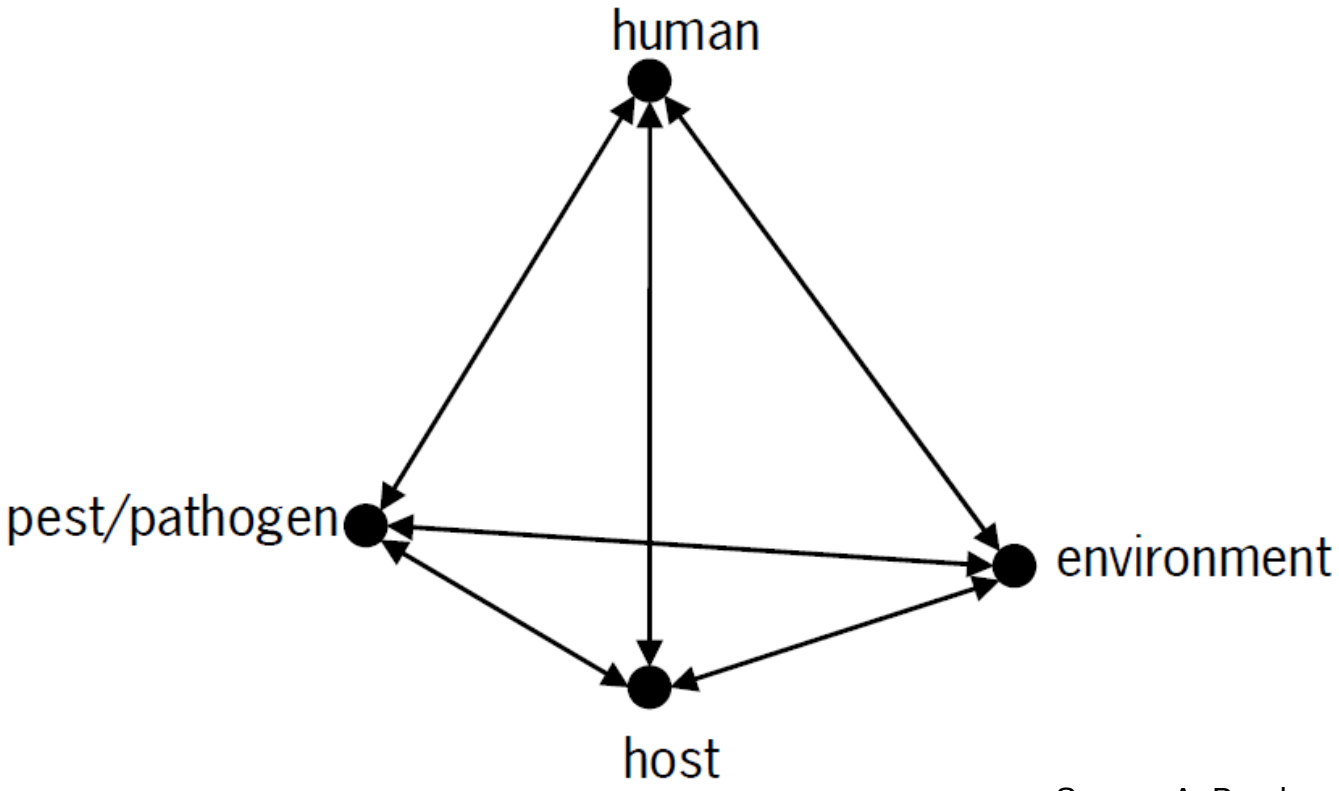
The disease tetrahedron – illustrating the interactions between pathogens, hosts environment and human



Source: A. Breukers, 2010

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Impacts of Temperature Increase on Plant Health

Pests

- improved winter survival
- increased fertility
- accelerated population development
- raised virulence
- better dispersal opportunities
- reduced dormancy
- increased growth
- enlarged geographical range

Hosts

- induced stress in/decreases susceptibility
- breakdown of resistance mechanisms
- increased lignification of plant(+)

Environment

- change in effectiveness of nat. predators
- Imbalance of development synchronity
- change of ecosystem may affect distribution & new pest introductions

Humans

- extension of production period (+/-)
- increased pesticide applications (+-)
- shifts in plant breeding (+/-)
- shifting crop production ranges
- increased trade of host commodities

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Impacts of Precipitation Increase on Plant Health

Pests

- fungal and bacterial pathogens increased infectivity
- competitive edge for certain weeds
- increased spread of pathogens
- increased growth
- enlarged geographical range

Hosts

- increased foliage surface wetness increases foliar pathogens
- susceptibility of plant affected by humidity
- changes in plant architecture and structure

Environment

- change of ecosystem may affect distribution & new pest introductions

Humans

- increasing or changing pesticide applications (+-)
- changing pest control practises
- shifting crop production ranges
- increased trade of host commodities

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Impacts of other Climate Change Factors on Plant Health

- Increased CO_2 or O_3 may affect plant architecture, plant physiology and structure leading to greater susceptibility
  - however increased photosynthesis rate may slow down pathogen invasion
- Changes in wind pattern will affect distribution of pests
- Extreme weather conditions (e.g. hurricanes, tornadoes) act as long distance dispersal vehicles for pests
- Extreme weather conditions and their effects (e.g. storm damage) will weaken plants and make them more susceptible to pests.

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Major Challenges in Plant Health

- World-wide shifts in host distribution and cultivation will increase risks for pest distribution
- Shifting trading patterns will increase risks for pest distribution
- Emergence of “new” pests
- Pests extending their geographical range will cause extension of pest distribution
- Pest surveillance and diagnostics need to be improved
- Strengthening of Pest Risk Analysis capacity is indispensable
- Enhancing plant health research and international collaboration will be crucial

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THE INTERNATIONAL YEAR OF PLANT HEALTH in 2020

An Effort to Raise the Public and Political Awareness of Plant Health to help governments and the international community to address these challenges for plant health

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Thank You!

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