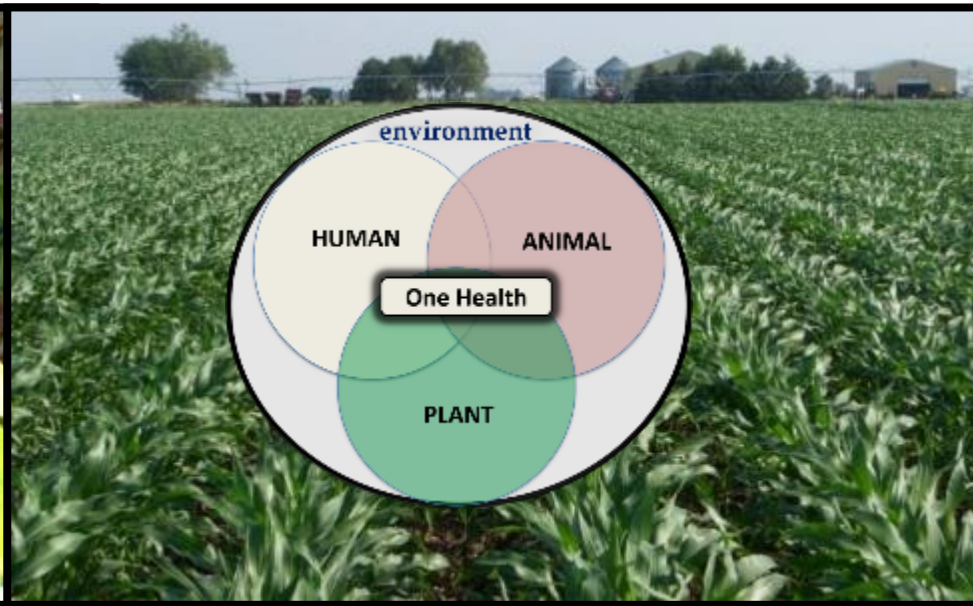




Climate Change Impacts on Crop Pests: AMR Implications





Climate Change Impacts on Crop Pests: AMR Implications



climate change increases stress on plant systems

The impacts of climate change on plant systems are substantial, well documented, and include:

- Reduced productivity, geographic range change,
- Altered flowering times globally (Nature, BBC)
- Increased disease prevalence and severity
- These impacts are not uniform and difficult to forecast at fine levels of spatial resolution



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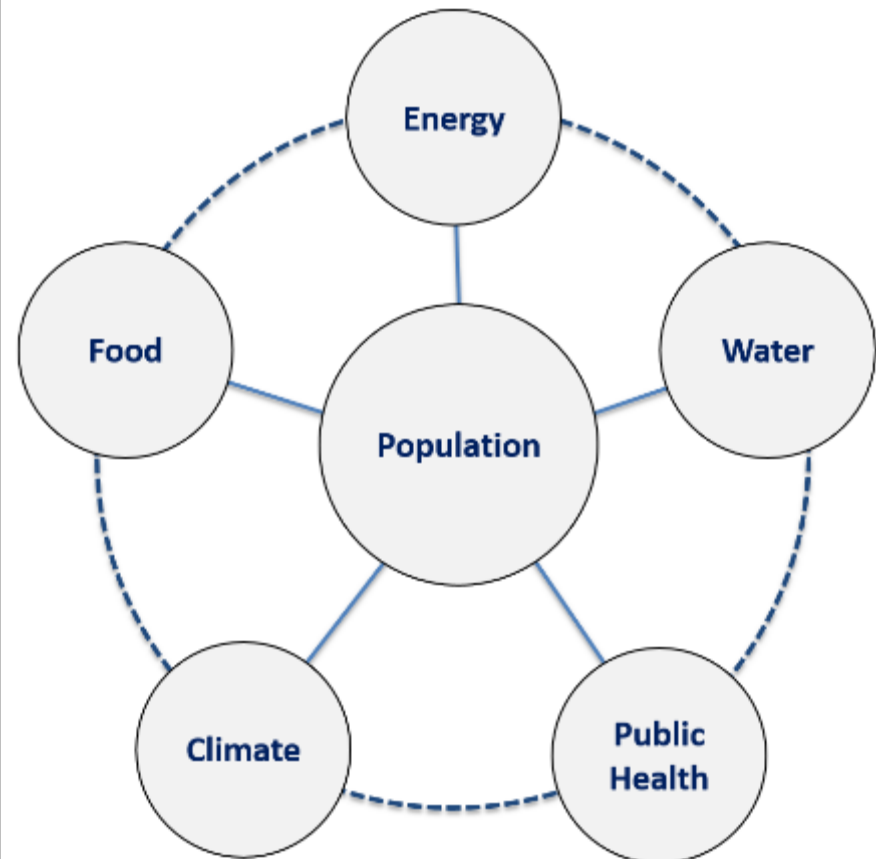


Climate change impacts to crop pests include:

- Expanded geographic range for pathogens and their vectors as a consequence of changes in host range
- Emergence of new pathogen-vector relations as a consequence of expansion into new geographic areas
- Emergence of hybrid species as a consequence of range overlap and regional and global trade networks
- Re-emergence from permafrost melt

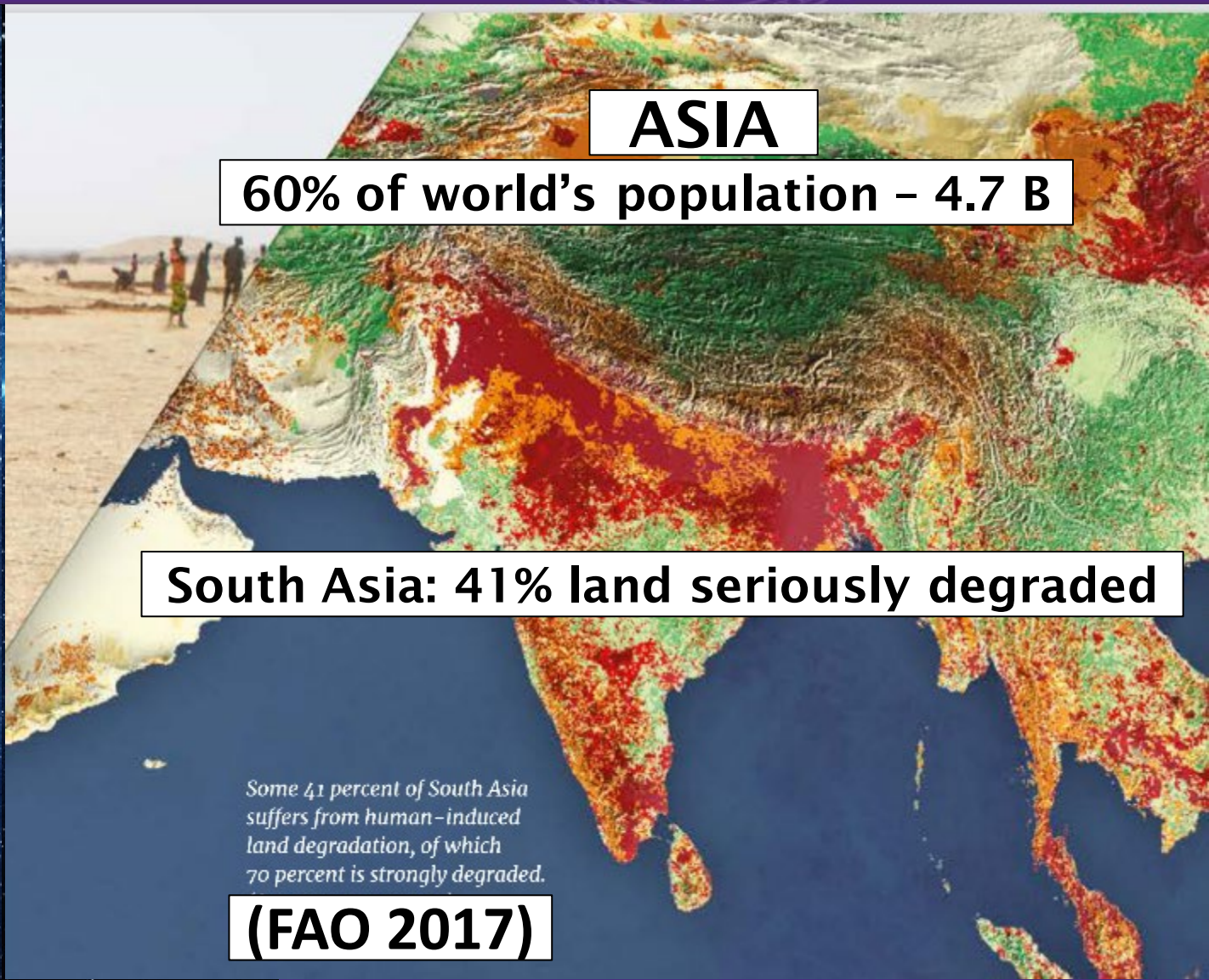
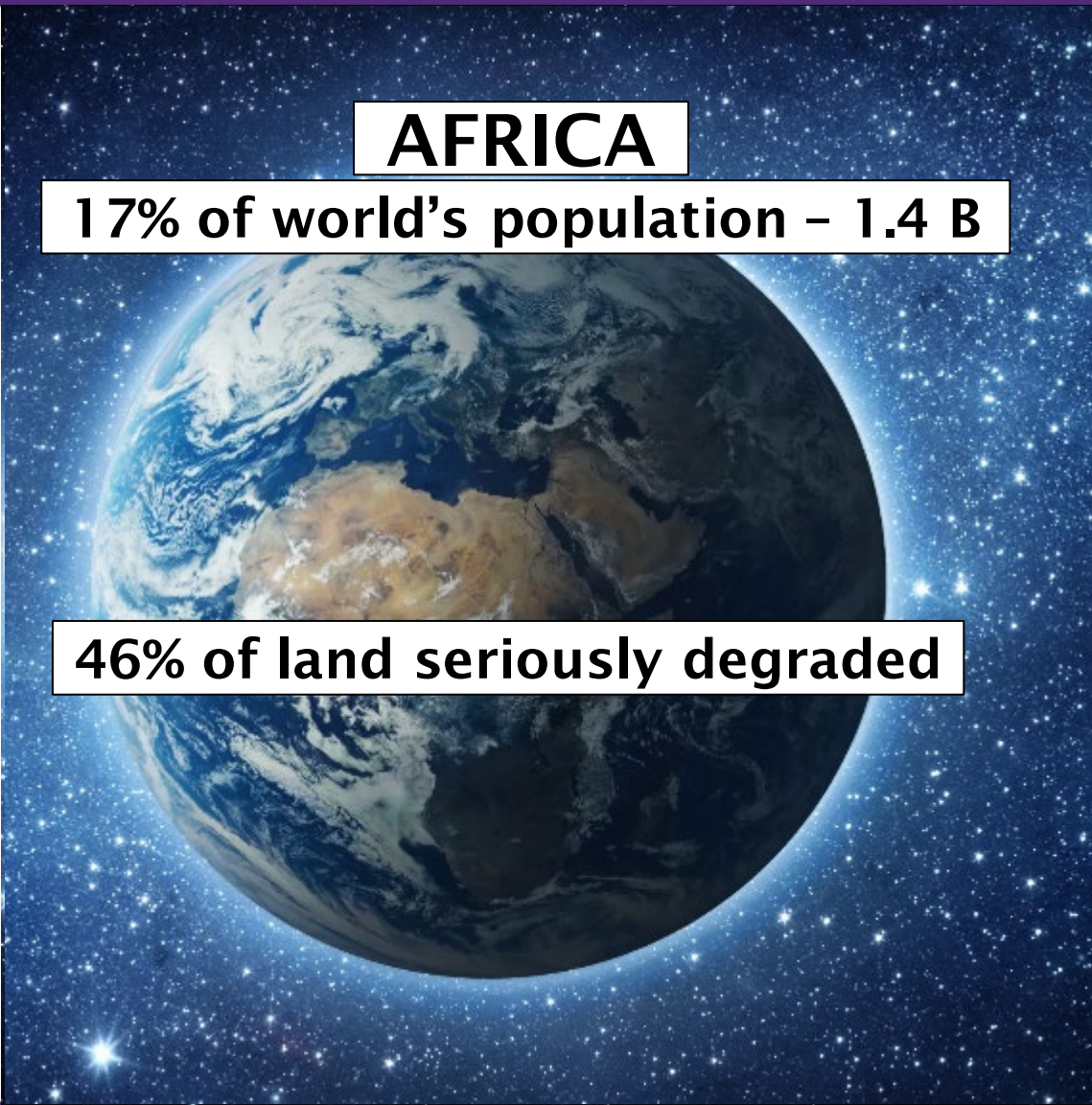


Climate Change Impacts on Crop Pests: AMR Implications



Grand Challenges

- There are multiple challenges to plant health that impact human health and wellbeing
- These challenges must be addressed as systems
- If we address them individually we will fail collectively – this is true for AMR as well
- Population, demographics, and human behavior put increasing pressures on each challenge





to: Casier/flickr
ENVIRONMENT | MIGRATION | POVERTY AND INEQUALITY
The effects of global warming on rural-urban migrations

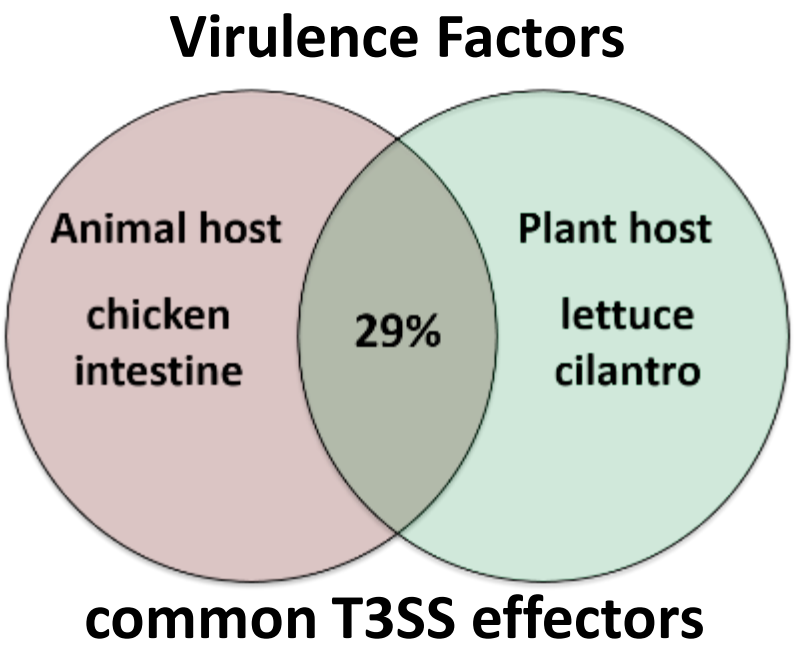


Climate shocks will cause chronic crop loss/failures with local to global impacts:

- undernourishment leading to low immune function and increased susceptibility to bacterial infections (foodborne pathogens)
- increased use of antibiotics and increased AMR from widespread overuse (common)
- increased migration to cities disseminating AMR to population dense urban centers
- A challenge anywhere is a challenge everywhere



Salmonella, Shigella, E. coli, Listeria are plant colonists – not contaminants



frontiers in
MICROBIOLOGY

ORIGINAL RESEARCH ARTICLE
published: 27 May 2011
doi: 10.3389/fmicb.2011.00119



Surface structures involved in plant stomata and leaf colonization by Shiga-toxigenic *Escherichia coli* O157:H7

Zeus Saldaña¹, Ethel Sánchez², Juan Xicohtencatl-Cortés³, Jose Luis Puente⁴ and Jorge A. Girón^{1*}

ORIGINAL ARTICLE

WILEY Plant Cell & Environment

Plant Cell Environ. 2019

A human pathogenic bacterium *Shigella* proliferates in plants through adoption of type III effectors for shigellosis

Sung Hee Jo^{1,2} | Jiyoung Lee^{1,3} | Eunsook Park⁴ | Dong Wook Kim^{5,6} | Dae Hee Lee^{2,7} |

Opinion



Special Issue: Specificity of plant–enemy interactions

Plants as alternative hosts for *Salmonella*

Adam Schikora¹, Ana V. Garcia² and Heribert Hirt²



Applied and Environmental Microbiology

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Food Microbiology

The *Salmonella* Transcriptome in Lettuce and Cilantro Soft Rot Reveals a Niche Overlap with the Animal Host Intestine

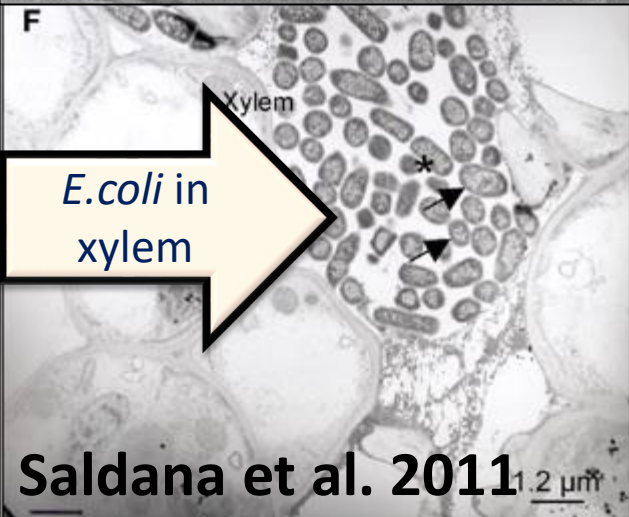
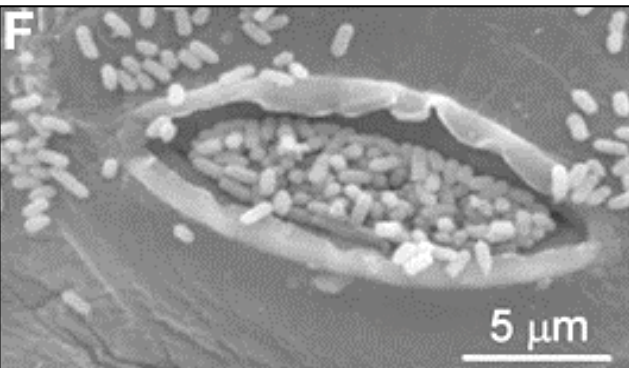
Danielle M. Coudeau, Craig T. Parker, Yegueng Zhou, Shlomo Seia, Yulia Kroupitski, Merla T. Brandl

11110149, www.asmscience.org, doi:10.1111/1365-3113.12111



Climate Change Impacts on Crop Pests: AMR Implications

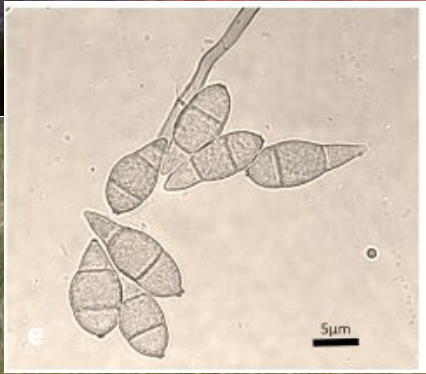
E. coli in plants



- Collaborative colonization: 2-log population increase of foodborne bacterial pathogens when co-inoculated with plant pathogenic bacteria?
- Genetic cross-talk: *Salmonella* plasmids in plant pathogenic bacteria, vancomycin resistance genomic island in *Rathayibacter toxicus*
- Streptomycin, oxytetracycline and kasugamycin are used to manage some bacterial diseases of plants – transfer of AMR genes among species? dissemination of AMR strains in plants and plant products?
- Bidirectional evolution of pathogenicity?

Climate Change Impacts on Crop Pests: AMR Implications

- Fungicide resistance is a major and growing threat to effective management of fungal diseases of plants
- Wheat 2nd most important staple food crop
- Wheat blast is an emerging, extremely damaging disease with few management options – spread from South America to South Asia and Eastern Africa – bad news
- Pathogen populations with simultaneous resistance to three fungicide chemistries have evolved

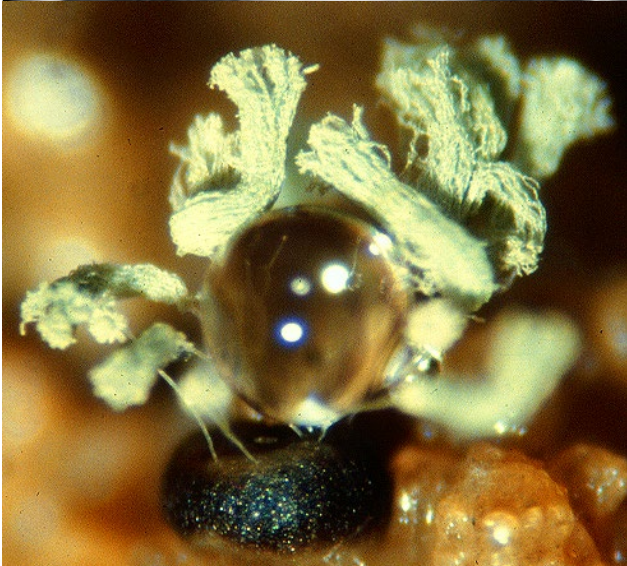
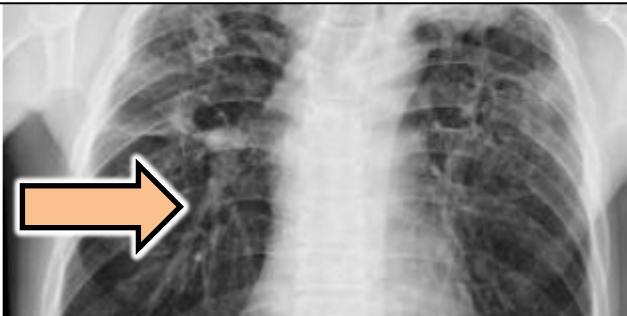


Wheat Blast



Climate Change Impacts on Crop Pests: AMR Implications

Aspergillosis



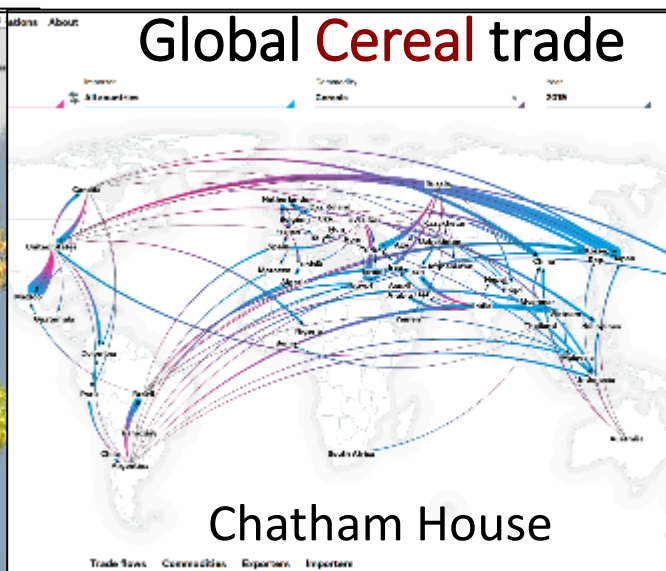
- WHO list of priority fungi – 1.7 million deaths annually from fungal infections – more than from malaria
- Fungicide resistance is a major threat to effective treatment of fungal infections in humans – resistant *Aspergillus fumigatus* linked to agriculture applications
- Primary fungicide therapeutics used for humans are the same chemistries used for managing fungal diseases in agric. and hort.
- Olorifim: promising new chemistry for human infections – label for agricultural use now being pursued – Is this rational?

Climate Change Impacts on Crop Pests: AMR Implications

- As new pathogen strains emerge due to climate change **AND** antibiotic-resistant strains and fungicide-resistant strains emerge due to public health and plant health practices...
- We will ensure their rapid dissemination around the planet through global trade and travel networks – it's the way we do business.



Flightradar24.com



Climate Change Impacts on Crop Pests: AMR Implications

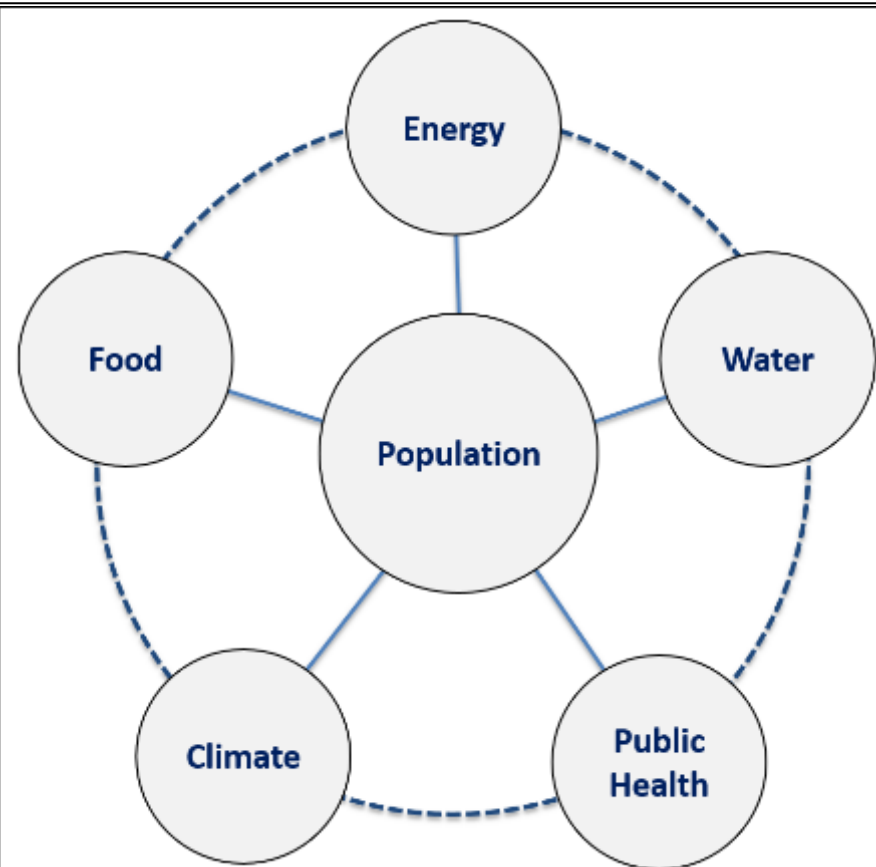
- World Food Program: “... hunger is tied to civil unrest. ...when people get hungry enough, they move, and populations on the move are prone to conflict.”
- World Food Program: over 100 million people annually require emergency food aid.
- *Climate, conflicts set to plunge millions into food crisis.* - Reuters





Climate Change Impacts on Crop Pests: AMR Implications

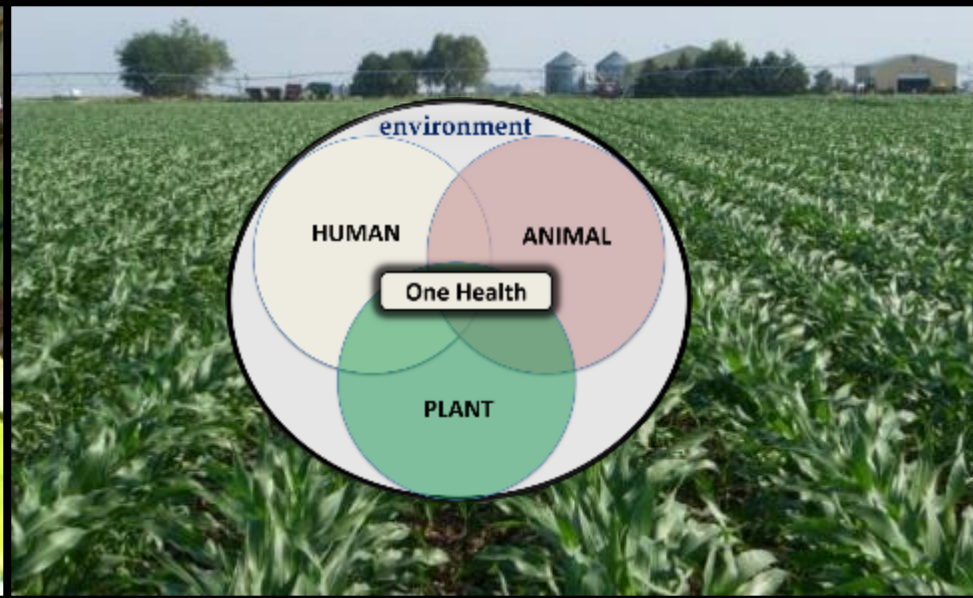
Grand Challenges



- Policy provides the framework for decision-making.
- We need coordinated policies for strategic deployment of antibiotic and antifungal chemistries across application sectors – namely, public health and agriculture
- This needs to be an international collaborative process including, government agencies, industries, and NGOs - A challenge *anywhere* is a challenge *everywhere*.
- These challenges must be addressed as systems - if we address them individually we will fail collectively



Climate Change Impacts on Crop Pests: AMR Implications



Thank you
Have a nice day!