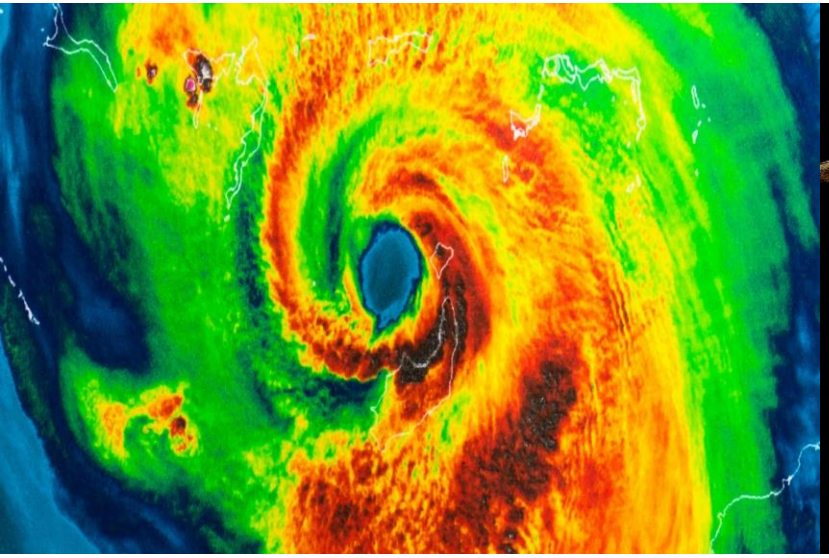
ASEAN FAW ACTION PLAN
Supporting IPM Across Southeast Asia

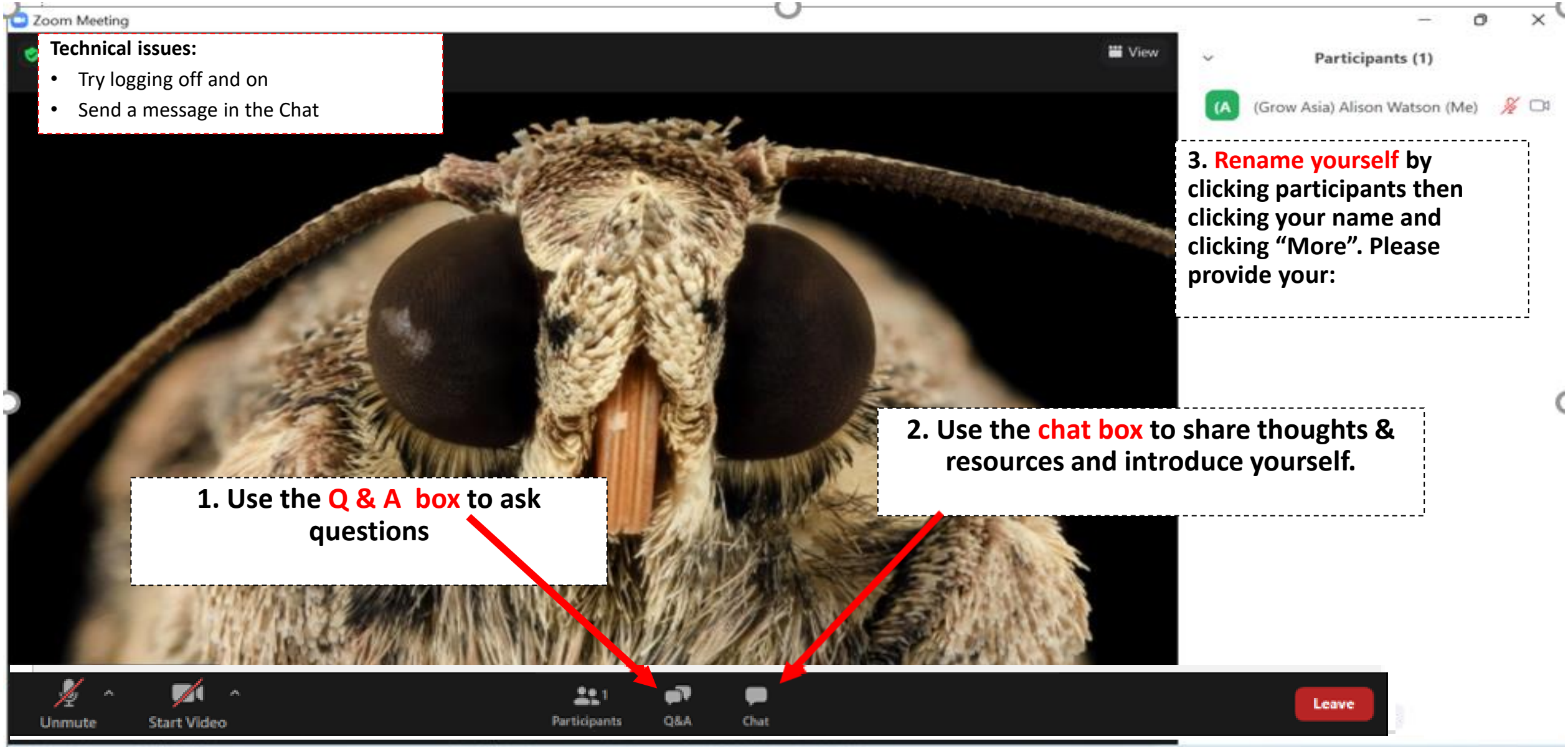
Resistance and Resilience Workshop Starter Series August & September 2022

Part 1: Climate change and transboundary plants pests and diseases in Southeast Asia - with a focus on fall armyworm



16 August 2022

The session will be recorded. A copy will be posted 1 week after this session.



Introductory Workshop Schedule

Part 1: Climate change and transboundary plants pests and diseases in Southeast Asia - with a focus on fall armyworm

16 August 2022

06 September 2022

Part 2: The role of genomics in understanding strategies for management of plant pests and disease in Southeast Asia - with a focus on fall armyworm

REGISTER for the next session:
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WATCH the sessions: **https://www.aseanfawaction.org/videos**

EMERGING RESEARCH

Current Opinion in Insect Science
Volume 49, February 2022, Pages 15-21

Potential distribution of invasive crop pests under climate change: incorporating mitigation responses of insects into prediction models

Gang Ma, Chun-Sen Ma

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News & Views | Published: 09 December 2021

CLIMATE CHANGE

Global warming and China's crop pests

Daniel P. Bebber

Nature Food **3**, 6–7 (2022) | Cite this article

314 Accesses | **1** Citations | **6** Altmetric | Metrics

A new dataset that comprises more than 5,500 historical crop pest and disease records in China provides a unique opportunity to understand how climate affects crop pest and disease outbreaks.

…**warmer night-time temperatures** contribute most to the increasing occurrence of CPDs (11% ± 9%). Projections of future CPDs show that at the end of this century, **climate change will lead to an increase in CPD occurrence by 243% ± 110% under a low-emissions scenario (SSP126) and 460% ± 213% under a high-emissions scenario (SSP585),** with the magnitude largely dependent on the impacts of warmer nighttime temperatures and **decreasing frost days**.

Insect Pest Management Under Climate Change

Nasir Masood, Rida Akram, Maham Fatima, Muhammad Mubeen, Sajjad Hussain, Muhammad Shakeel, Naeem Khan, Muhammad Adnan, Abdul Wahid, Adnan Noor Shah, Muhammad Zahid Ihsan, Atta Rasool, Kalim Ullah, Muhammad Awais, Mazhar Abbas, Dilshad Hussain, Khurram Shahz… Ishfaq Ahmad, Imran Khan, Khalid Hussain & Wajid Nasim

Chapter | First Online: 22 October 2021

440 Accesses | **3** Citations

The Impact of Climate Change on Agricultural Insect Pests

by Sandra Skendžić [1,2,*], Monika Zovko [2], Ivana Pajač Živković [1], Vinko Lešić [3] and Darija Lemić [1]

1 Department of Agricultural Zoology, Faculty of Agriculture, University of Zagreb, Svetosimunska 25, 10000 Zagreb, Croatia
2 Department of Soil Amelioration, Faculty of Agriculture, University of Zagreb, Svetosimunska 25, 10000 Zagreb, Croatia
…ion Centre Nikola Tesla, Unska 3, 10000 Zagreb, Croatia
…ondence should be addressed.

…rschler
ttps://doi.org/10.3390/insects12050440

Since temperature is the most important environmental factor affecting insect population dynamics, it is expected that global climate warming could **trigger an expansion of their geographic range, increased overwintering survival, increased number of generations, increased risk of invasive insect species and insect-transmitted plant diseases, as well as changes in their interaction with host plants and natural enemies.** As climate change exacerbates the pest problem, there is a great need for future pest management strategies. These include monitoring climate and pest populations, modified integrated pest management strategies, and the use of modelling prediction tools

Breeding forages with climate resiliency in temperate/tropical transition zones

Kenneth H. Quesenberry, Esteban F. Rios, Kevin E. Kenworthy, Ann R. Blount, Paul E. Reith

First published: 29 June 2022 | https://doi.org/10.1111/gfs.12566 | Citations: 1

Article | Published: 05 August 2021

Plant pathogen infection risk tracks global crop yields under climate change

Thomas M. Chaloner, Sarah J. Gurr & Daniel P. Bebber

Nature Climate Change **11**, 710–715 (2021) | Cite this article

5190 Accesses | **35** Citations | **408** Altmetric | Metrics

Climate change and the emergence of fungal pathogens

Nnaemeka Emmanuel Nnadi, Dee A. Carter

Published: April 29, 2021 • https://doi.org/10.1371/journal.ppat.1009503

Climate Change, Resistance, Resilience

	Topic	Speaker
15:00	Introduction	
15:05	**Maize: Facing the challenge of climate change and FAW**	**Dr Prassana Boddupalli** (CIMMYT)
15:25	Q & A	
15:35	**Work plans of the IPPC Focus Group**	**Chris Dale** (Chair of the IPPC Focus Group on Climate Change and Phytosanitary Issues),
15:45	Q & A	
15:55	**The relationship between climate change and transboundary pests in Southeast Asia**	**Dr Sulav Paudel/Dr Craig Phillips** (AgResearch New Zealand)
16:10	Q & A	
16:20	**Closing thoughts**	

POLL

Are you currently undertaking work/research looking at climate change and plant pest and disease management?

Do you think climate change will have an impact on plant pests and diseases?

Should we consider new varieties of climate resilient (e.g., heat tolerant) and FAW-resistant maize?

How important is managing resistance in FAW populations across Southeast Asia?

August 16, 2022

CGIAR Plant Health Initiative

Maize: Facing the Challenges of Climate Change and Fall Armyworm

Prasanna Boddupalli

Director, Global Maize Program, CIMMYT

& CGIAR Plant Health Initiative Lead

Email: b.m.prasanna@cgiar.org

Maize in Asia, especially in the tropical environments, is highly vulnerable to climatic extremes and variability…

Drought

Waterlogging

Heat

Banded Leaf & Sheath Blight

***Turcicum* Leaf Blight**

Post Flowering Stalk Rot

Downy Mildew

Global Yield Losses dueto Crop Pests and Diseases

Plant Health and Rapid Response to Protect Food Security and Livelihoods

Plant Health Initiative

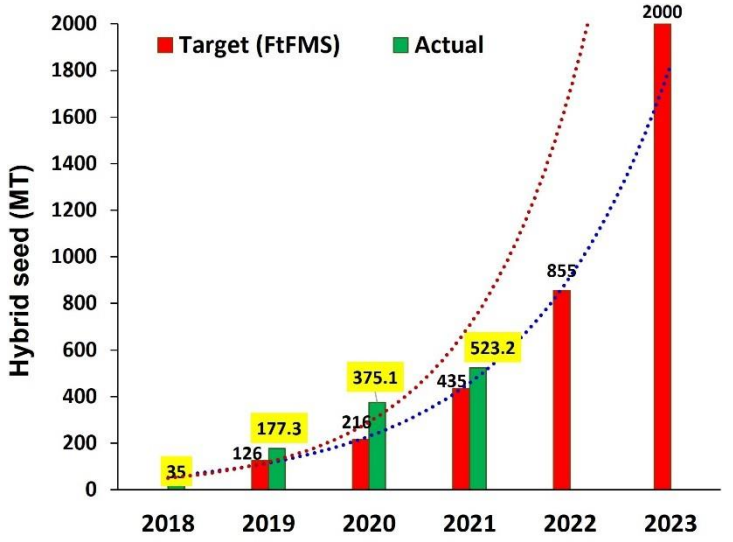
- **Average yield losses:**
  - 21.5% (10.1 to 28.1%) in wheat
  - 30.3% (24.6 to 40.9%) in rice
  - **22.6% (19.5 to 41.4%) in maize**
  - 17.2% (8.1 to 21%) in potato
  - 21.4% (11 to 32.4%) in soybean
- Increasing risks to agri-food systems through existing and emerging pests and diseases
- Massive economic and environmental implications → **US$26.8 billion crop losses annually**

Climate-resilient Maize for South Asia

13 unique climate-resilient (drought-tolerant / heat + drought-tolerant) yellow maize hybrids being commercialized by **27 SME seed companies** in India, Nepal, Bangladesh and Pakistan

AAA maize

Heat + drought-tolerant maize in S Asia



Drought-tolerant AAA maize in India

syngenta foundation for sustainable agriculture

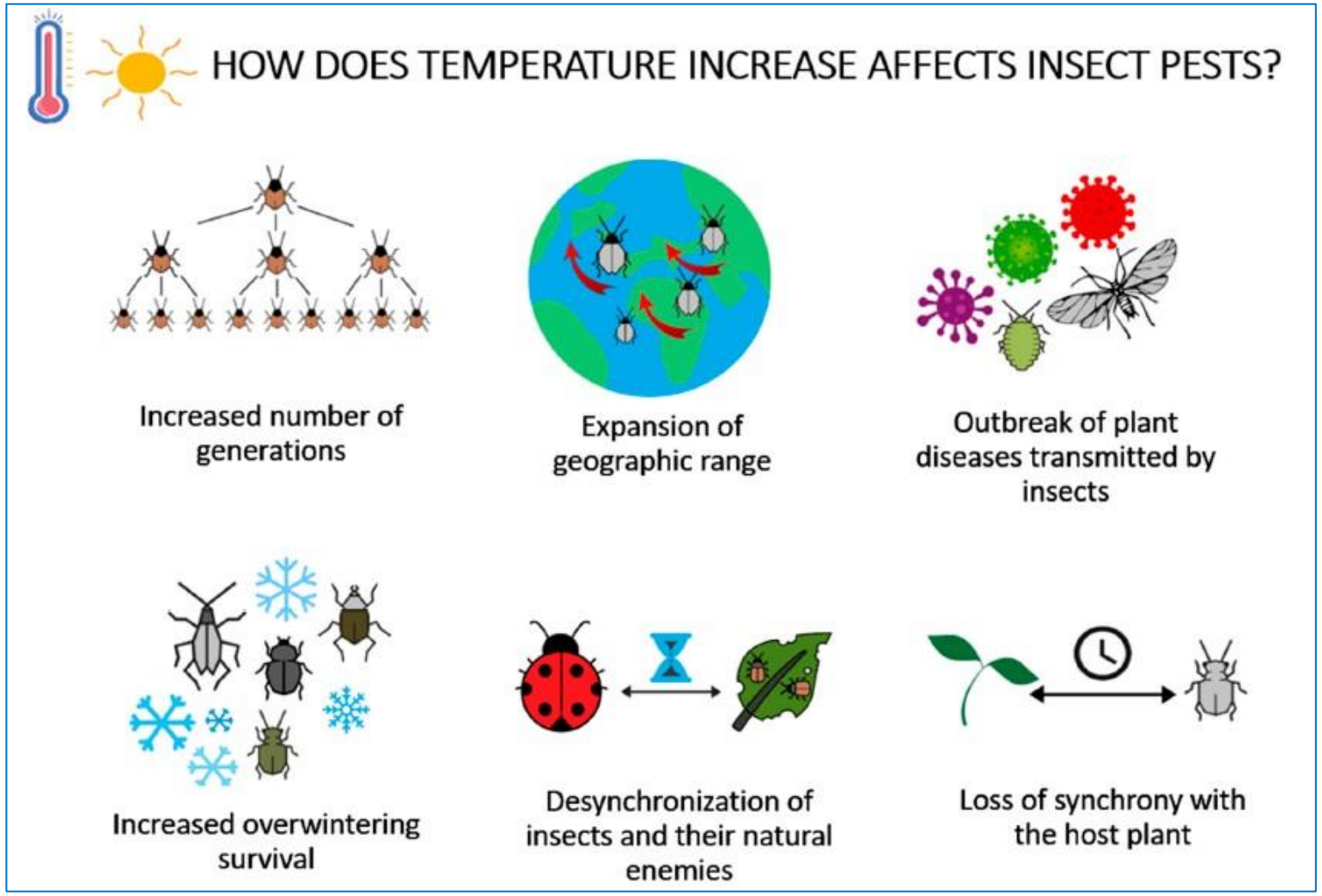
Climate Change: Unique Challenge to Plant Health

- **Rising temperatures, changes in precipitation, atmospheric CO_2 increase + human activities and increased market globalization** = situation favourable to increased pest establishment and movement.
- Strong evidence that climate change has already expanded host range and geographical distribution of some of the insect-pests and pathogens, and may further increase the risk of pest/pathogen introduction to new areas.

Emerging pests/pathogens are those that:

1) have increased in either incidence, geographical, or host range;
2) have changed pathogenesis/capacity for infestation;
3) have newly evolved; or
4) have been discovered or newly recognized.

Climate change can affect insect-pests in various ways….



- Expansion of geographic distribution
- Increased survival during overwintering
- Increased number of pest generations
- Altered synchrony between plants and pests
- Altered interspecific interaction
- Increased risk of invasion by migratory pests
- Increased incidence of insect-transmitted plant diseases
- Reduced effectiveness of biological control, especially natural enemies.

Source: Skendžić et al. (2021)

CGIAR Plant Health Initiative

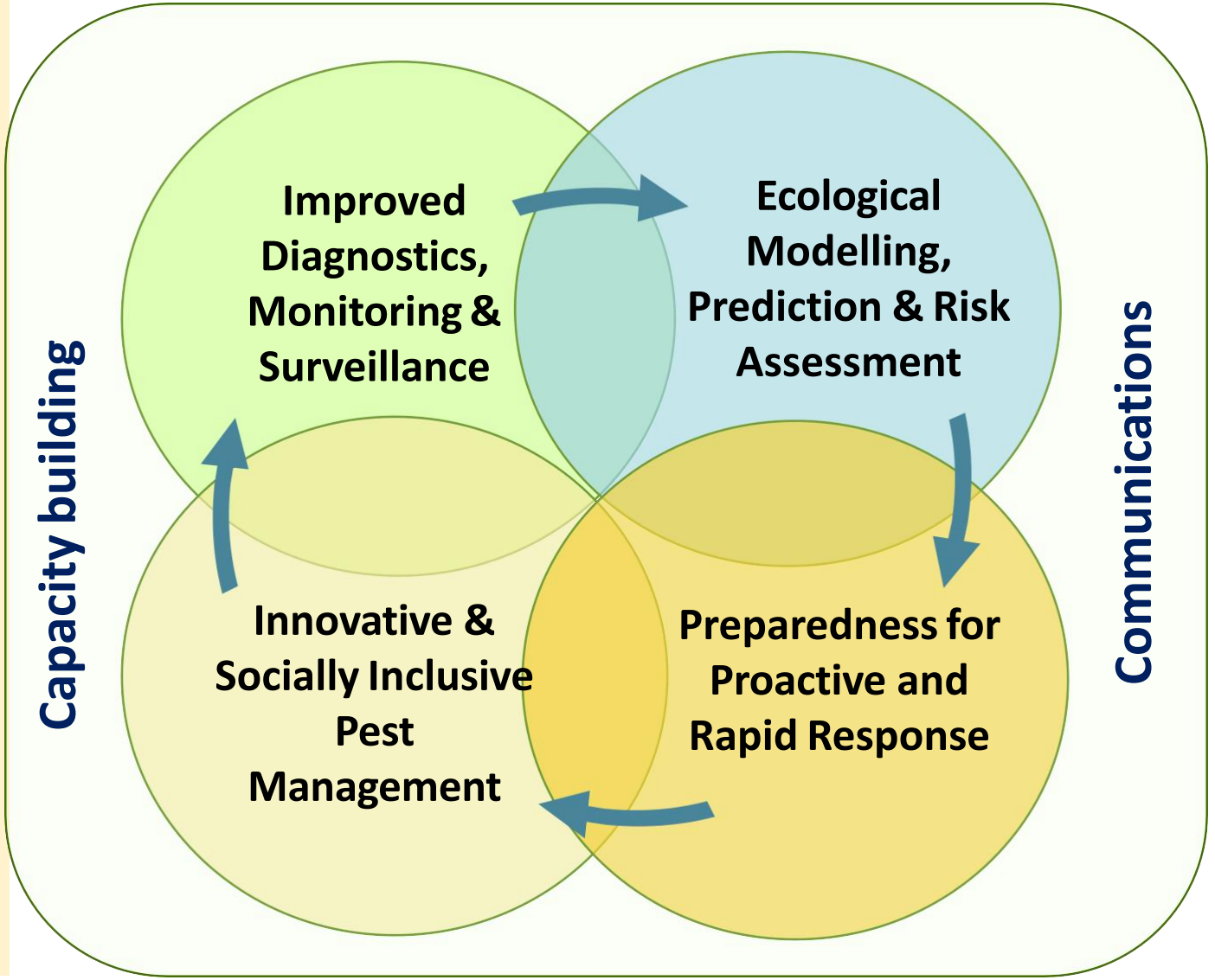
CGIAR | Plant Health Initiative

Aim

To protect agri-food systems of the LMICs in Africa, Asia and Latin America from devastating pest and disease incursions/outbreaks, by leveraging/ building viable networks across an array of national, regional and global institutions.

Focus

High-impact and/or high-risk pests and diseases causing major food security shocks and severe economic impacts in the LMICs in Africa, Asia and Latin America.



Integrated Pest and Disease Management

Prioritized Pests and Diseases for PHI Phase 1(2022-2024)

CGIAR | Plant Health Initiative

Crop Pests and Diseases	ESA	WCA	CWANA	S Asia	SE Asia	LAC
Rice: Brown plant hoppers, Stemborers, Thrips	■	■		■	■	
Wheat: Fusarium head blight	■					■
Wheat: Wheat blast	■			■		
Maize: Maize lethal necrosis	■					
Maize, Sorghum & Millets: Fall armyworm	■	■		■	■	
Maize: *Striga* spp. **& Food Legumes** (Cowpea, Fababean, Lentil): *Alectra vogelii*, *Orobanche* sp.	■	■	■			
Banana: Fusarium wilt TR4, Xanthomonas and other Wilts	■	■		■	■	■
Banana: Bunchy top	■			■		
Potato: Late blight; Soil-borne diseases, including nematodes	■			■		■
Potato: Purple top	■					■
Sweet Potato & Cassava: White flies	■					■
Cassava: Cassava brown streak disease	■	■				
Yam: Yam mosaic virus		■				
Food legumes (Cowpea, Chickpea, Lentil): Pod borers (*Maruca vitrata*, *Helicoverpa armigera*)	■	■	■	■	■	
Vegetables: Aphids**,** Thrips & Fruit flies	■	■		■	■	
Tomato: Tomato leaf miner (*Tuta absoluta*) & Fruit worm (*Helicoverpa armigera*)	■			■	■	

PHI builds on a foundation of work on plant health management by CGIAR & Partners

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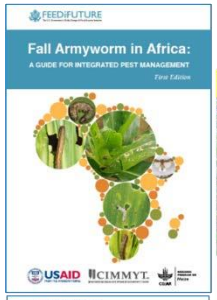
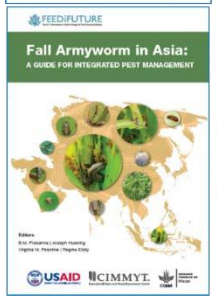
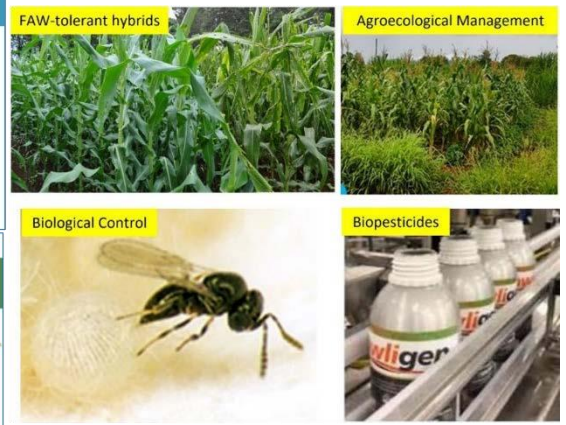
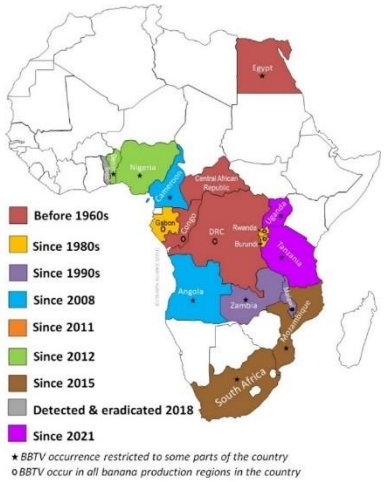
Fall Armyworm (FAW)



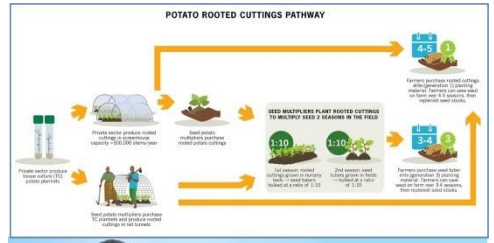




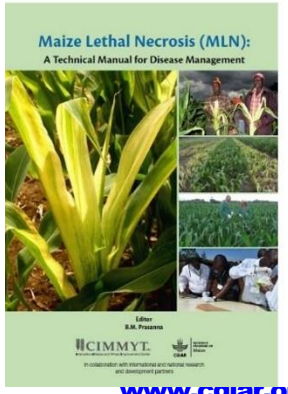
Banana Bunchy Top Virus (BBTV)



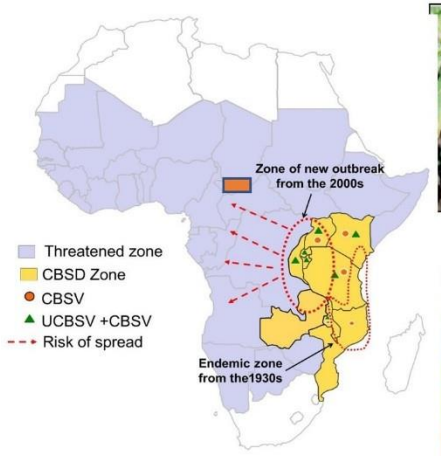
Potato Disease Management



Maize Lethal Necrosis (MLN)



Cassava Brown Streak Disease (CBSD)



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Breeding Climate Resilient Maize with Native Genetic Resistance to FAW

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Cuban Flints

Tuxpeno

In 1990s, CIMMYT maize team in Mexico unraveled native genetic resistance in some of the landraces (especially Cuban flints and the Mexican Tuxpeños) to FAW.

More than **10,000** CIMMYT maize germplasm entries screened so far against FAW under artificial infestation at Kiboko, Kenya, during 2017-2022.

Can we combine climate resilience with FAW tolerance in maize? Yes, we can!

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Selecting right combinations of parental lines for constituting several hybrids (climate resilience + FAW resistance + disease resistance + other farmer-preferred traits)

On-station evaluation for yield, disease resistance & other climate resilient traits

"Choice" experiments under FAW artificial infestation (after mass-rearing of FAW neonate larvae) in screenhouses

Selection of **a subset of candidate hybrids for "No Choice" trials** in FAW screenhouses

On-farm evaluation of selected hybrids to assess farmers' preferences and performance under natural FAW infestation

Product advancement using both on-station and on-farm data

Product announcement for partners' uptake; nomination of hybrids to National Performance Trials (NPTs)

NPTs; Varietal registration/release in the country; Seed scale-up & Commercialization

Breeding Climate-resilient Maize Hybrids with Native Genetic Resistance to FAW

Some Critical Steps

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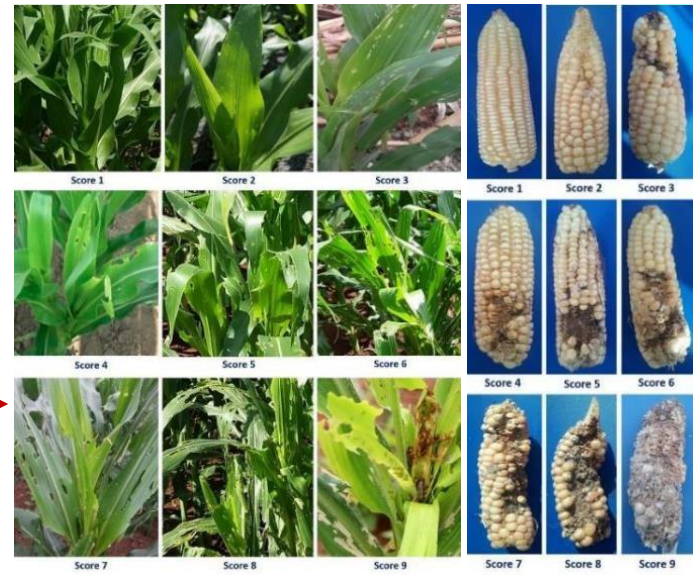
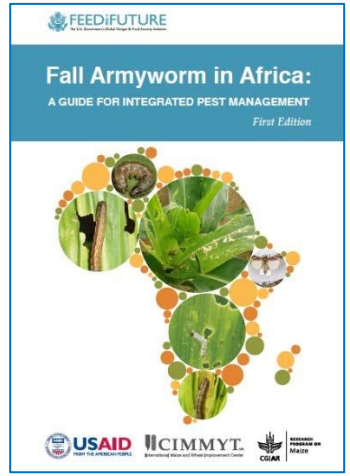
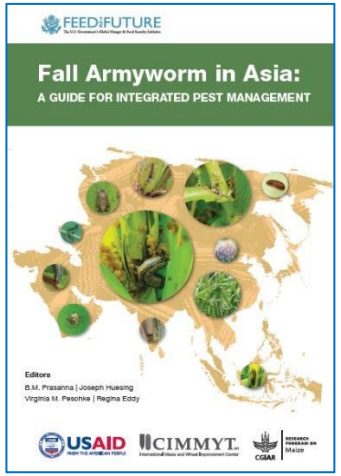
FAW Mass Rearing

Germplasm Screening under FAW Artificial Infestation

Rating of Germplasm







FAW-tolerant CIMMYT Inbred Lines shared globally…

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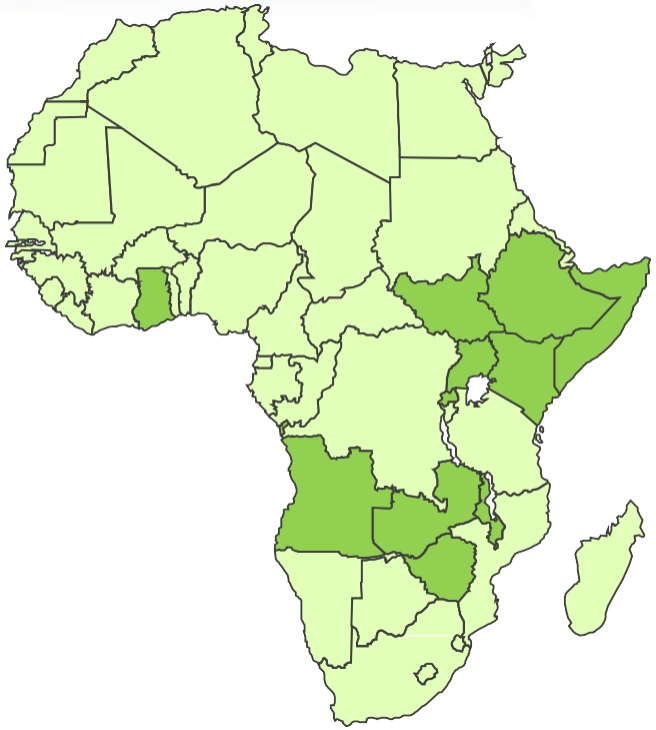
Type of Institution	Africa	Asia	Latin America	North America	Europe	Australia	Total
NARES / ARIs / Universities	14 (11)	9 (6)	14 (5)	3 (2)	1 (1)	2 (1)	**43 (26)**
Commercial seed companies	11 (7)	10 (6)	22 (4)	2 (1)	4 (3)		**49 (21)**
Total	**25 (13)**	**19 (9)**	**36 (6)**	**5 (2)**	**5 (3)**	**2 (1)**	**92 (34)**

FAW-tolerant Hybrids under NPTs in Africa

FAW-tolerant CIMMYT Hybrid

FAW-susceptible Commercial Check



- **South Sudan has released all the three FAW-tolerant hybrids in May 2022.**
- **National Performance Trials (NPTs) ongoing in 11 other countries in Africa**. Varietal releases expected by Q4 of 2022/Q1 of 2023.

In Summary…

- **CIMMYT's work in sub-Saharan Africa** clearly demonstrates the opportunity to diversify FAW management options for farming communities with native genetic resistance to FAW, coupled with climate resilience and other farmer-preferred traits.
- Need for **targeted investment in SE Asia in coping with the challenges of FAW and climate change.**
- **Insect resistance management** → even in countries where *Bt* maize is being deployed, polygenic native genetic resistance to FAW could be complementary to oligogenic transgenic resistance

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CPM Focus Group on Climate Change and Phytosanitary Issues

Chris Dale – FG-CCPI Chair

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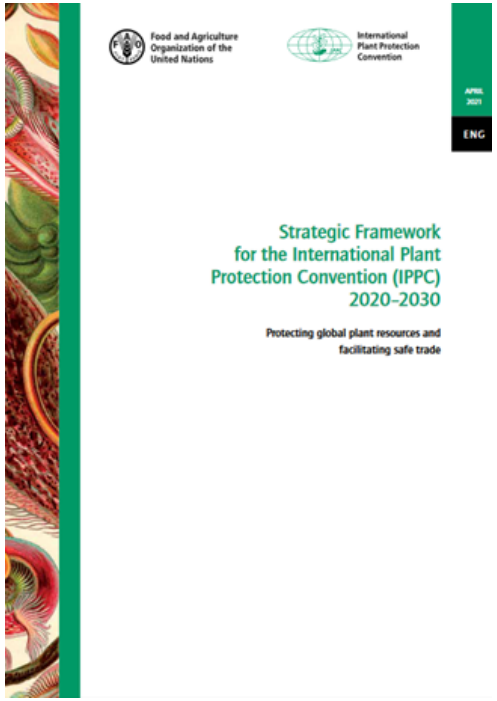
DEVELOPMENT AGENDA ITEM – STRATEGIC FRAMEWORK 2020 - 2030

Assessment and management of climate change impacts on plant health



GOAL

By 2030, the **impacts of climate change on plant health** and the **safe trade of plants and plant products** are evaluated, especially in relation to **pest risk assessment** and **pest risk management issues**, and **phytosanitary issues** are represented and highlighted within the international climate change debate.

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CONTRIBUTION TO THE UN SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Goal 13: Take urgent action to combat climate change and its impacts

1.Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

2.Integrate climate change measures into national policies, strategies and planning

3.Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

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Focus Group on Climate Change and Phytosanitary Issues (FG-CCPI)

Background

- Recommended by the Strategic Planning Group in October 2020
- Approved by the CPM-15 in April 2021
- Formally endorsed by the CPM Bureau in July 2021
- First meeting in September2021
- Backgrounddocument: **Scientific review of the impact of climate change on plant pests**

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FG-CCPI Membership

- FG-CCPI is composed of ten members with specialized skills and experience in climate change and phytosanitary issues, and knowledge of the IPPC and its activities
- FG-CCPI includes a Bureau 'Champion' representative
- FG-CCPI will remain effective until CPM-19 (2025)

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KEY OUTCOMES AND CORE ACTION AREAS

Outcome 1: Raising awareness of the impacts of climate change on plant health

Core action areas:

- Convene and participate in meetings and side events related to the impacts of climate change on plant health
- Facilitate discussions within IPPC subsidiary bodies, regional workshops as well as other IPPC technical groups
- Assist Contracting Parties (CPs) to meet their National Reporting Obligations (NRO)established by IPPC

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KEY OUTCOMES AND CORE ACTION AREAS

Outcome 2: Enhancing the evaluation and management of risks of climate change to plant health

Core action areas:

- Support countries to collect, analyse and use climate change impacts-related information in decision-making

- Support countries in building capacity to help mitigate the impacts of climate change on plant health

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KEY OUTCOMES AND CORE ACTION AREAS

Outcome 3: Enhancing the recognition of phytosanitary matters in the international climate change debate

Core action areas:

- Strengthen collaboration with relevant international, regional and national organizations
- Facilitate, promote and support phytosanitary issues -related policy dialogue at the global level

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FG-CCPI Action Plan - Priorities 2022-2023

1.Raising awareness of the impacts of climate change on plant health through increasing CPM wide understanding of how climate change may increase of the potential movement and spread of pests through **webinars and special sessions** involving CPM, RPPOs and NPPOs

2.Exploring opportunities to **enhance IPPC National and Regional reporting systems** to **identify and share climate change information** relating to changes in pest distributions, host range, and adaptability of pests and host plants

3. Developing a **'Climate Change Impacts on Plant Health' webpage** on the IPP as a repository of all FG-CCPI related materials and resources

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FG-CCPI Action Plan - Priorities 2022-2023

4.Enhancing the evaluation and management of risks of climate change to plant health to incorporate climate change factors into the traditional Pest Risk Analysis (PRA) processes, and investigating opportunities to incorporate climate change considerations in existing pest surveillance systems and practices

5. Developing an IPPC Guide to assist NPPOs in identifying, assessing, mitigating and managing climate change impacts on plant health

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FG-CCPI Action Plan Implementation Mechanisms

- FG-CCPI Action plan is to be implemented between **2022** and **2025** at the **global**, **regional and national levels**

- **NPPOs, RPPOs, relevant international organizations,** and **major donors** are expected to be called, to actively contribute to the **resourcing, planning and implementation** of the action plan

- **Coordination and alignment** of this work with that of the **other relevant international organizations**, as well as **collaboration** with other relevant **public and private sector institutions** and **organizations** will be critical.

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FG-CCPI Action Plan Implementation Mechanisms

- Implementation of the action plan will be monitored against its key performance indicators and deliverables through IPPC monitoring and evaluation processes.

- This action plan is intended to **strengthen the work of IPPC and its partners**, in consultation with **NPPOs and RPPOs**, to the **assessment and management of climate change impacts on plant health**.

- The actions and outcomes included in the Action Plan should not be understood as instruments endorsed by Contracting Parties who do not request their implementation in their national jurisdiction.

Core action areas	Key activities	Tentative delivery dates	Priority
Outcome 1: Awareness on the impacts of climate change on plant health is improved			
Convene and participate in meetings and side events related to the impacts of climate change on plant health	Convene a global Level Webinar (to CPs) on the impacts of climate change on plant health	Feb – May 2022	HIGH
	Convene a regional Level Webinar series (to RPPOs and NPPOs) on the impacts of climate change on plant health (targeted to regional priorities)	Feb – May 2022	HIGH
	Give the presentation titled "Initiatives to Address the Increasing Risk to Plant Health from Plant Pests Due to Climate Change" at the 2021 North American Plant Protection Organization (NAPPO) annual meeting	November 3, 2021	HIGH
	Promote the FG-CCPI and its action plan at the 2022 IPPC Plant Health conferences	2022	HIGH
	Investigate opportunities to raise awareness on the impacts of climate change on plant health at the next UN Climate Change Conference Forums	2022 - 2025	MEDIUM
Raise awareness on the impacts of climate change on plant health	Investigate opportunities to raise awareness of the impacts of climate change on plant health, including cultural and social impacts (e.g., radio talk shows, social media, poster and flyers, digital platforms, etc.)	2022 - 2025	MEDIUM
	Develop a 'climate change impacts on plant health' webpage (landing page) on the IPP as a repository of all FG-CCPI related materials and resources	2022 - 2023	HIGH
	Engage stakeholders at different levels (Online survey and in-person and telephone interactions) to gather information on climate change impacts on plant health (potential Implementation Review and Support System (IRSS) survey	2022	HIGH/ MEDIUM
Facilitate discussions within IPPC subsidiary bodies, regional workshops as well as other IPPC technical groups and CPM	Include the 'climate change impacts on plant health' topic into the agenda of all upcoming IPPC IC, SC and Bureau meetings to raise awareness and investigate opportunities for collaboration	2022 – 2023	HIGH
	Include the 'climate change impacts on plant health' topic into the agenda of all upcoming IPPC Fall Armyworm (FAW) and Fusarium Tropical Race 4 (TR4) meetings to raise awareness and investigate opportunities for collaboration	2022 – 2023	HIGH
	Include the 'climate change impacts on plant health' topic into the agenda of all upcoming IPPC Communications FG meetings to raise awareness and investigate opportunities for collaboration	2022 – 2023	HIGH
	Include 'climate change impacts on plant health' topic into the agenda of all upcoming RPPO meetings and conferences (including annual workshops)	2022 - 2023	HIGH
	Include side session into the CPM agenda	April 5, 7 2022	HIGH

Core action areas	Key activities	Tentative delivery dates	Priority
Assist contracting parties (CPs) to meet their national reporting obligations (NRO) established by IPPC	Explore how the IPPC NRO system, which combines official reporting by contracting parties with other available and published information, may be enhanced to further share information on changes to pest distributions, host range, and adaptability of pests and host plants	2022 - 2023	HIGH
Outcome 2: Risks of climate change to plant health are evaluated and managed			
Support countries to collect, analyse and use climate change impacts-related information in decision-making	Review existing NPPO approaches to incorporating climate change considerations in pest risk analysis (PRA) and surveillance (e.g., questionnaire)	2022	HIGH
	Provide advice on the use of climate change modelse.g., pros and cons of different models, time period to use, uncertainties, geographical and temporal scale (webinars / guides/ e-learning courses)	2022 - 2025	LOW
	Provide advice on how to assess the impact of climate change on individual pests, the suite of pests on an individual crop and pest control methods	2022 - 2025	LOW
	Provide advice on developing tools or link to tools that will help phytosanitary risk assessments for climate change and pest issues	2022 - 2025	MEDIUM
	Recommend the use of internet-based identification tools that allow for the rapid identification of plant pests, e.g., USDA APHIS | Pest Identification Technology Lab, to help support increased plant pest surveillance and reporting recommendations in the FAO report on climate change impacts on plant pests	2022 - 2025	MEDIUM/LOW
	Recommend the creation of regional climate hubs, e.g., USDA Climate Hubs that provide science-based information to agricultural and natural resource managers to help address the effects of climate change. These climate hubs could help countries with adaptation and reduce climate change related damage	2022 - 2025	MEDIUM/LOW
	Review and recommend the use of predictive models for plant pests that incorporate the effects of climate change to inform strategic planning and improve pest management which supports the increased capacity building recommendation in the FAO report on climate change impacts on plant pests	2022 - 2025	MEDIUM/LOW
	Provide recommendation on the most appropriate means of incorporating climate change considerations into PRA and surveillance, whether through the development of recommendations, guidelines (e.g., IPPC Guide), and/or the creation or modification of ISPMs[5]	2022 - 2023	HIGH
	Include a 'climate change impacts on plant health' criteria (similar to the 'potential implementation issues' criteria) into the template for draft 'standard' specifications, draft guidance material specifications, and into the assessment criteria for the upcoming IPPC Call for topics	2022 - 2023	MEDIUM
	Review linkages and opportunities to support the CPM Recommendation on "Safe provision of food and other humanitarian aid to prevent the introduction of plant pests during an emergency situation[6]"	2022 - 2025	MEDIUM

Core action areas	Key activities	Tentative delivery dates	Priority
Support countries in building capacity on the impacts of climate change on plant health	Develop, review and promote tools to enhance the preparedness and response of Agricultural Extension Agents, farmers and other relevant stakeholders on the impacts of climate change on plant health	2022 - 2025	MEDIUM
	Conduct a review and evaluation of all IPPC guidance materials(guides, e-learning, website component pages) to investigate opportunitiesto incorporate 'climate change impacts on plant health' references and technical resources	2022 - 2025	MEDIUM
	Develop an IPPC guide to assist in identifying cultural and social impacts of climate change on plant health, including island communities under threat of sea level rise[7].	2022 - 2025	MEDIUM
Outcome 3: Enhanced recognition of phytosanitary matters in the international climate change debate			
Strengthen collaboration with relevant organizations	Cooperate and exchange information on climate change and plant health matters with the Intergovernmental Panel on Climate Change (IPCC) and other international and regional organisations (e.g., International Pest Research Group, Centre for Agriculture and Bioscience International (CABI))	2022 - 2025	HIGH
	Liaise with other relevant entities that deal with climate change such as the Secretariat of the Convention on Biological Diversity (CBD)	2022 - 2025	HIGH
Facilitate, promote and support phytosanitary issues-related policy dialogue at the global level	Mainstream phytosanitary policies into the climate change debate	2022 - 2025	MEDIUM

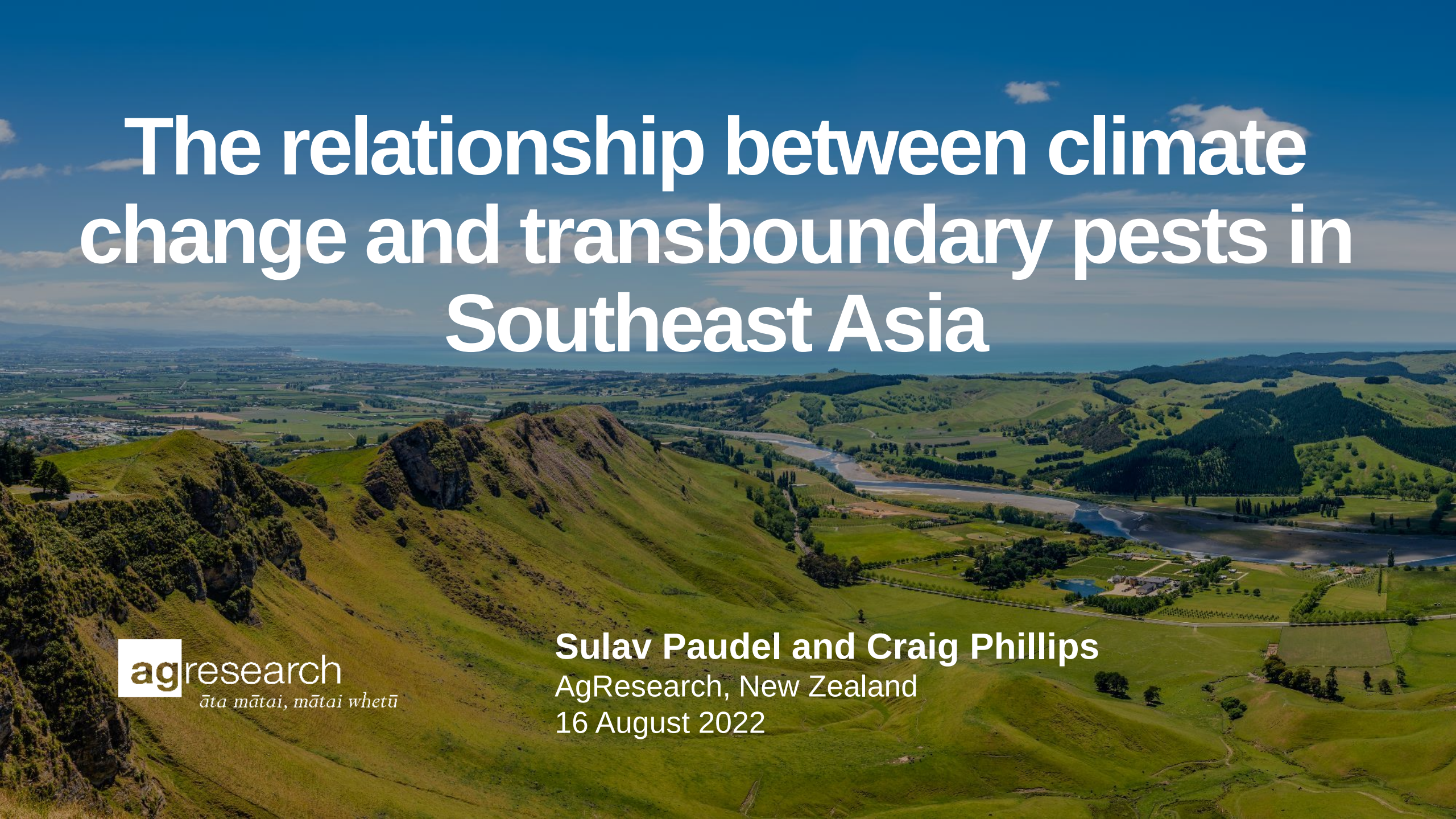
Thank you

IPPC Secretariat

Food and Agriculture Organization
of the United Nations (FAO)

ippc@fao.org | www.ippc.int

The relationship between climate change and transboundary pests in Southeast Asia



Sulav Paudel and Craig Phillips
AgResearch, New Zealand
16 August 2022

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In this presentation

- Introduction to AgResearch
- Climate change and transboundary pests: Possible areas of work for SE Asia
  - Climate matching app
  - Future pest species
  - Pest distributions and costs

AgResearch

- One of New Zealand's largest Crown Research Institutes
- NZ pastoral and biotechnology sectors: d**igital agriculture**, **climate change**, biotechnology, agronomy, **border biosecurity** and **pest management**
- A key partner in the **NZ Better Border Biosecurity (B3)** research collaboration
- AgR: International projects in the Pacific, Latin America and SE Asia

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Three broad possible areas of work for Southeast Asia- each involving analyses under current and future climates

- Climate matching application
- Predicting future biotic threats to SE Asian agriculture
- Estimating future distributions and impacts of key threats
  - Pests currently in SE Asia
  - Future biotic threats

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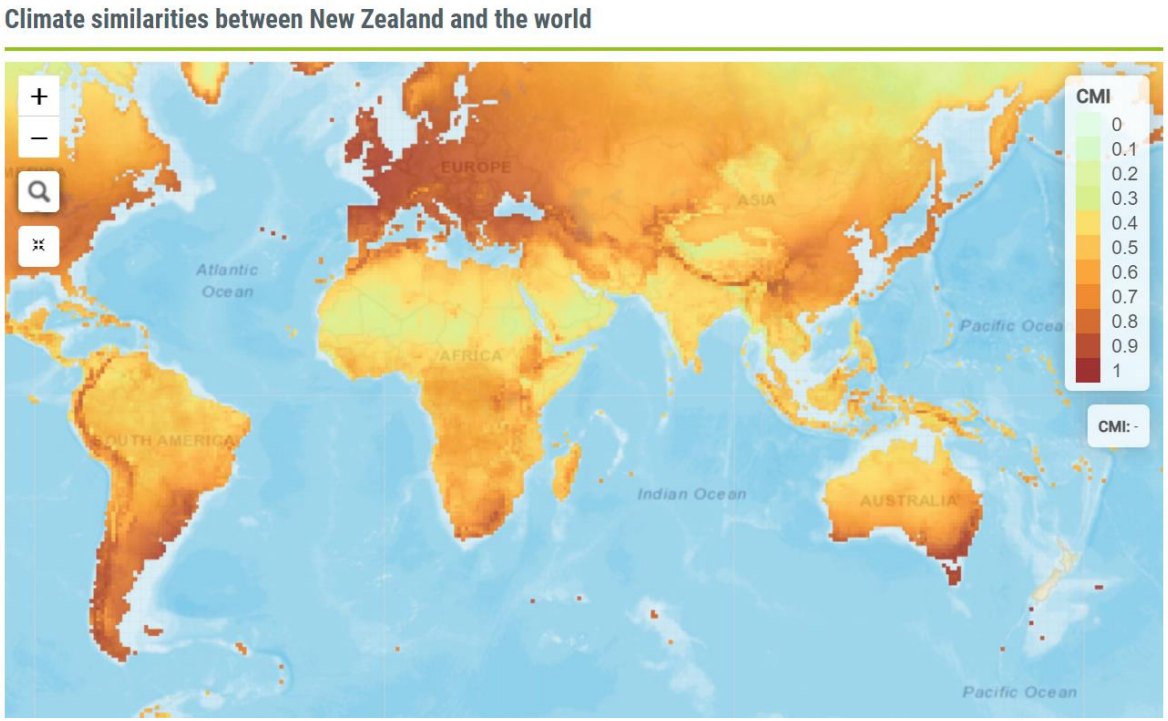
1.0 Climate matching application for SE Asia

- Display climatic similarities between SE Asian regions & the rest of the world under current and future climate scenarios
- CLIMEX's composite match index (CMI)
- Can be used in conjunction with information on habitat availability (e.g., crop presence) to help predict species' potential geographic distributions.



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Climate matching application: NZ example

- Current NZ version: https://b3nz.shinyapps.io/cmi-maps/
- New version in preparation: new climate match app beta version

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2.0 Predicting future biotic threats to SE Asian agriculture

- Select one or more high value crops
- Identify crop pests currently absent from SE Asia that are most likely to reach SE Asia and establish there
  - Collate lists of pests associated with crops of interest
  - Evaluate probability of arrival & establishment in SE Asia

Most of our work till today has been on insects and weeds; beginning to work on pathogens

Predicting future biotic threats: NZ examples

- New Zealand: several similar projects with dairy, forestry, kiwifruit, arable cropping & pipfruit industries
- Example of the results https://dnzpra.netlify.app/

DairyNZ plant pest risk analysis

Craig Phillips

2021-12-03

Preface

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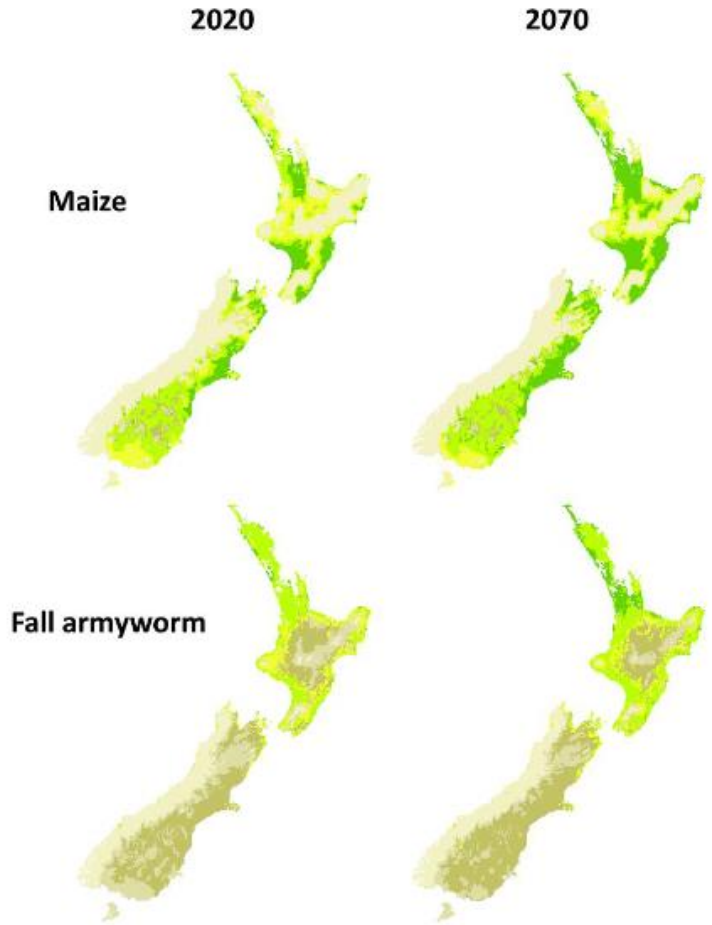
3.0 Estimating future distributions and impacts from current high impact pests

- Possible study pests include fall armyworm, rice blast, rice brown planthopper, citrus greening disease, and tephritid fruit flies (GC et al. 2022)
- Estimate future distributions, spread rates and potential economic costs under current and future climate scenarios
- Similar analysis could also be conducted for pests predicted to arrive in the region in the future



Projected climate suitability for Maize and Fall armyworm in NZ (Mansfield et al. 2021)

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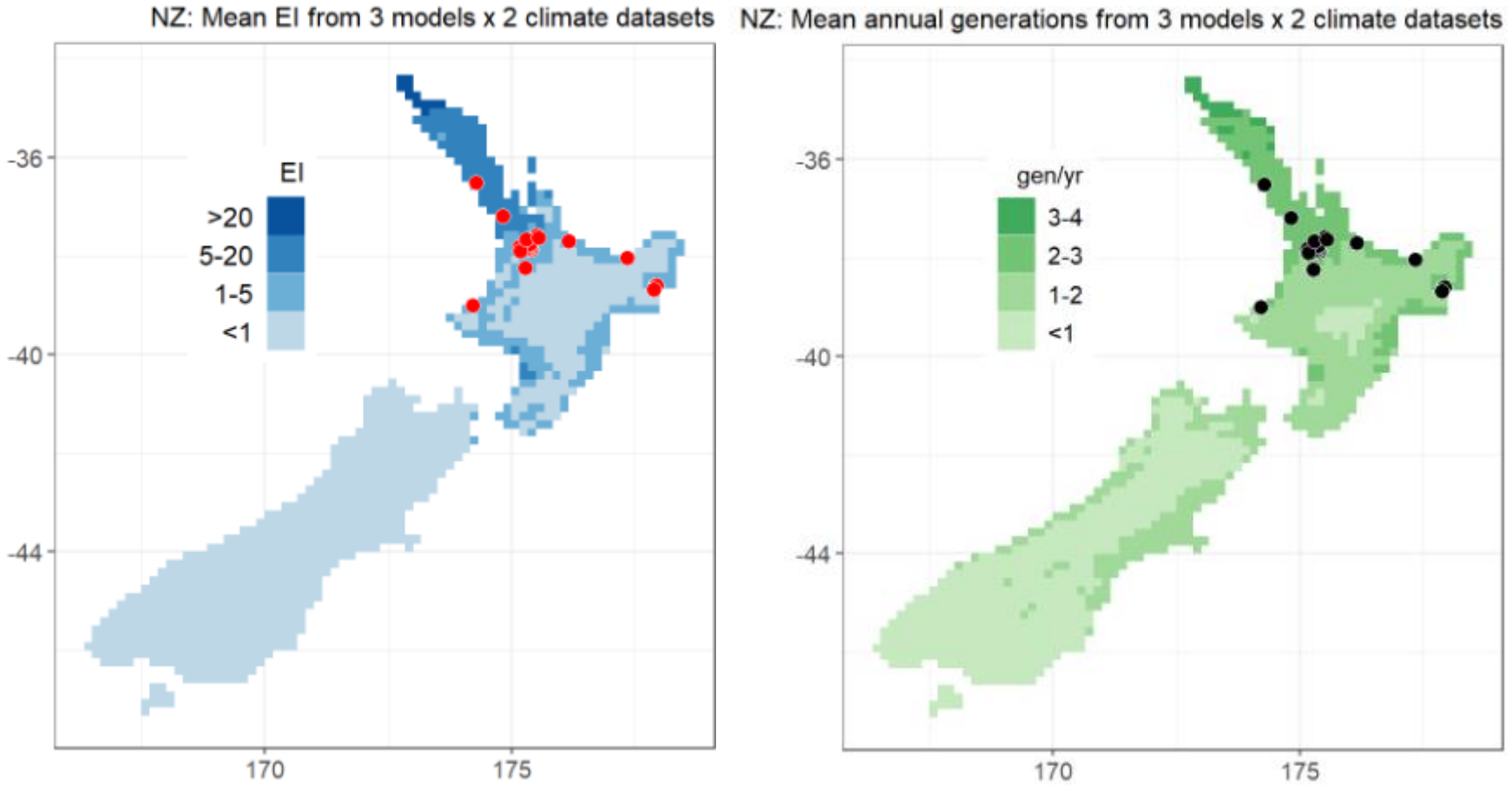
Future distributions and impacts from pests: FAW's potential winter range and no. of annual generations in NZ

Key questions

- Are NZ winters cold for long enough to kill FAW?
- If not, where in NZ it is likely to persist?



Red/black dots: Locations of winter records of FAW in NZ

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Importance and Application

- Climate match app
  - Identify sources of current and future pests
  - See locations with current climates that are like those predicted for SE Asia in the future
- Knowledge of pests likely to arrive in SE Asia in the future
- Knowledge of current and future pests' potential SE Asian distributions and impacts

- **Losses from insect pests (rice, wheat and maize): 10-25% per degree increase in temperature (Deutsch et al., 2018)**
- We would aim to provide early warning of incipient pest issues
- Methods applicable to diverse organisms and sectors.
- **Support government/non-government agencies to develop a strategy to respond to growing biotic threats to crops**

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Thank you!

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ASEAN Action Plan on Fall Armyworm

www.aseanfawaction.org

Australian Government
Department of Foreign Affairs and Trade

ASEAN FAW ACTION PLAN
Supporting IPM Across Southeast Asia