Scene Setting and Intended Workshop Outcomes




Workshop co-Chairs:

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AgMIP / AGCI Next-Generation Food Shocks Modeling Workshop

Aspen Global Change Institute
Aspen, Colorado
May 20th, 2019


Thanks
to AGCI
ASPEN

Practical Definitions

Next-Generation – Step change in the capabilities, design, user-friendliness, scope, connections, and accessibility
See also: Antle et al. (2017) and Janssen et al. (2017) -- Ag Systems

Food Shock – An acute interruption of the normal food system, which can have complex and far-reaching societal impacts

Modeling – Analytic tools allowing exploration of observed and unobserved system behaviors, fundamental system processes, and the effect of system changes (i.e, interventions)

Workshop – Time for us to put our heads together, move outside our comfort zones, build something better, and chart a course forward

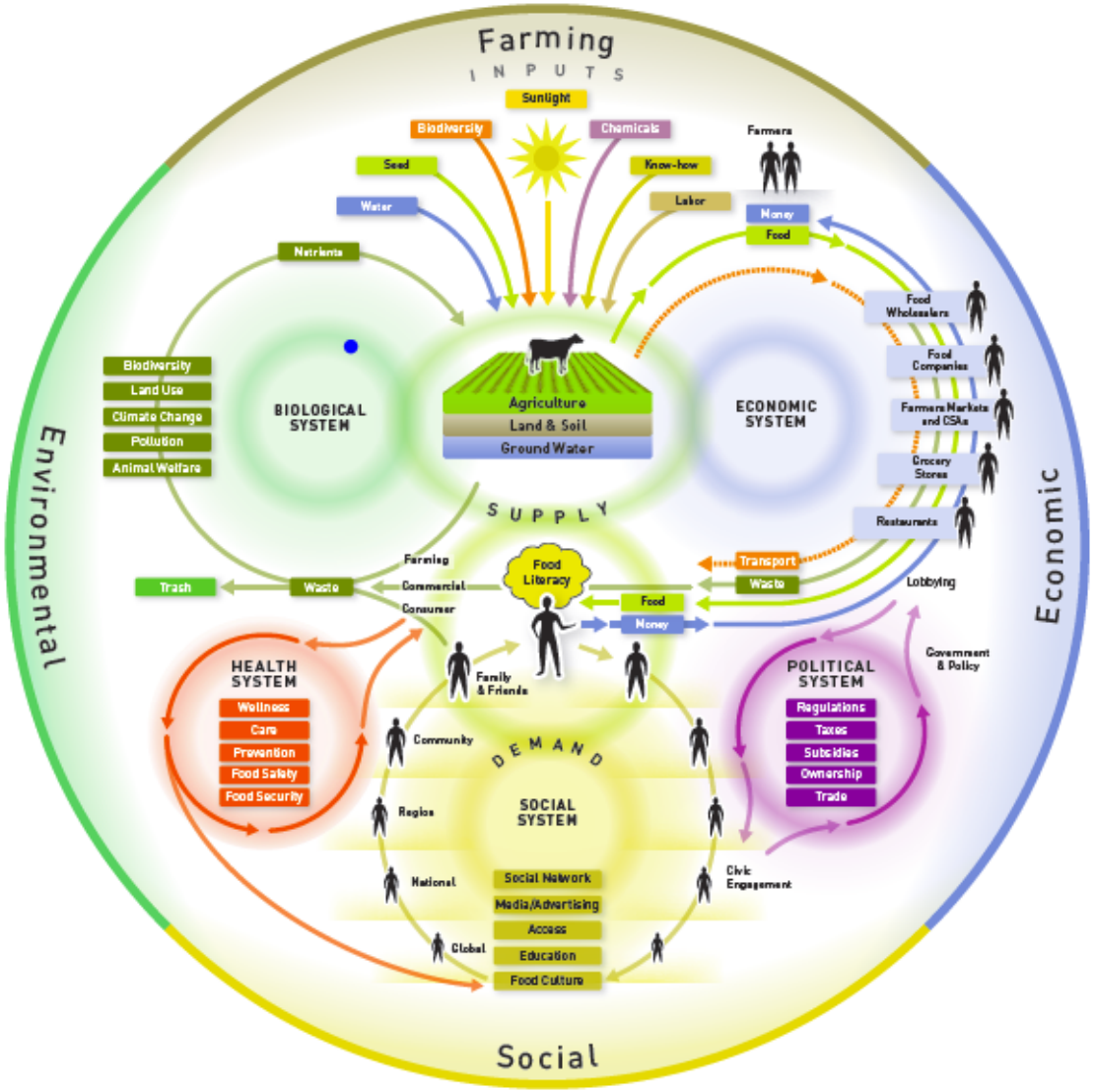

Nestlé
FIBRA MAIS
CEREAL INTEGRAL
O MAIS RICO em FIBRAS
350 g
CORN FLAKES
ULTRA BALL
SUCRILHOS
Moça Flakes
ESTRELITAS
MEL
CRUNCH CEREAL
NESCAU
FROOT LOOPS
SNOW FLAKES
4,19
5,99
8,49
7,49
6,99
7,49
5,99
7,49
6,49


Hipercard
PREÇOS

AgMIP The Agricultural Model Intercomparison and Improvement Project

Food System Involves Many Scales & Disciplines

Lots of potential leverage points



Many communities
Many actors
- decision contexts

Many models
Many interventions
- responsive
- proactive

Many gaps in current understanding
- processes
- feedbacks
- interventions
- unintended consequences

http://www.nourishlife.org/teach/food-system-tools/

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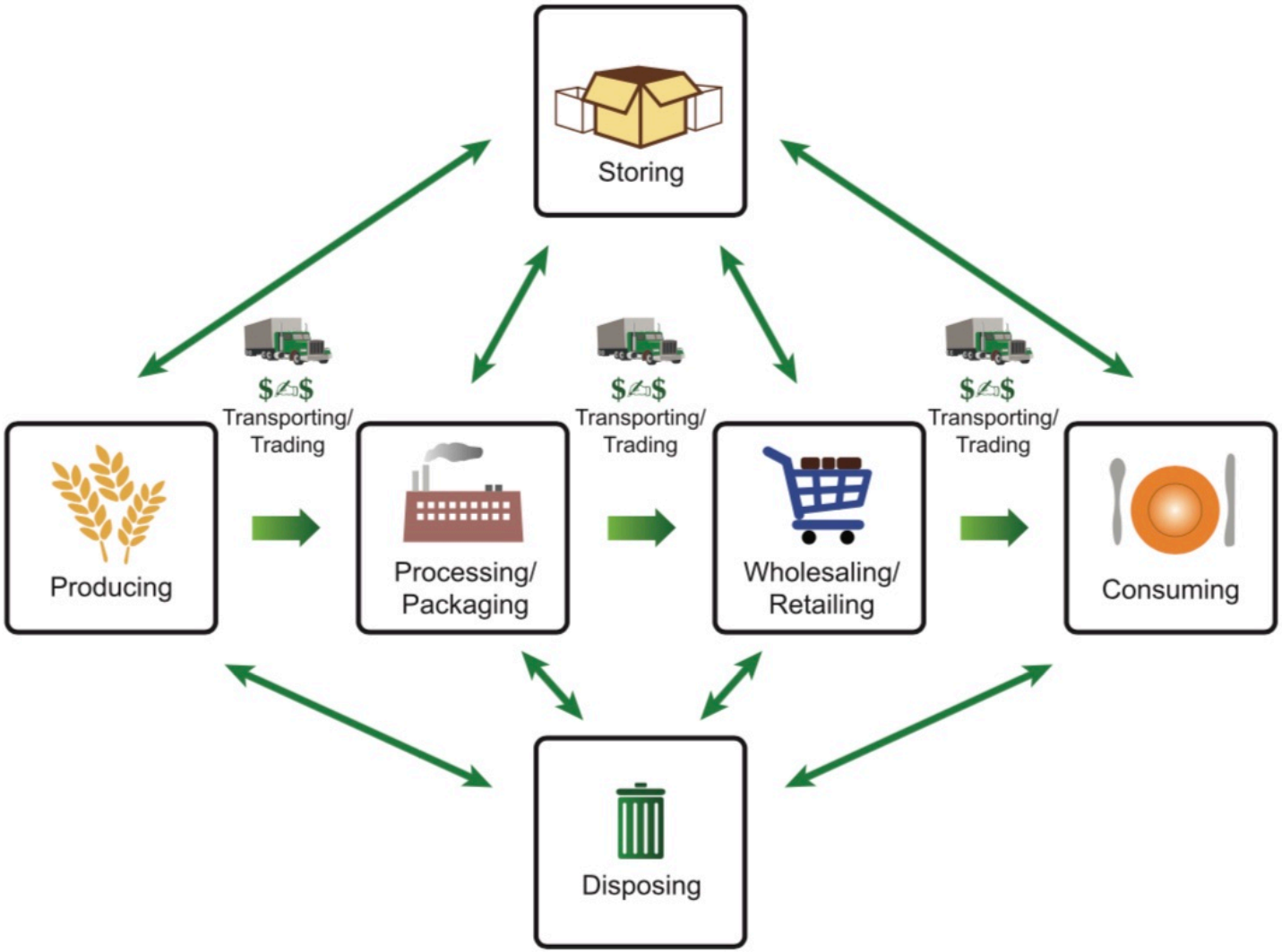
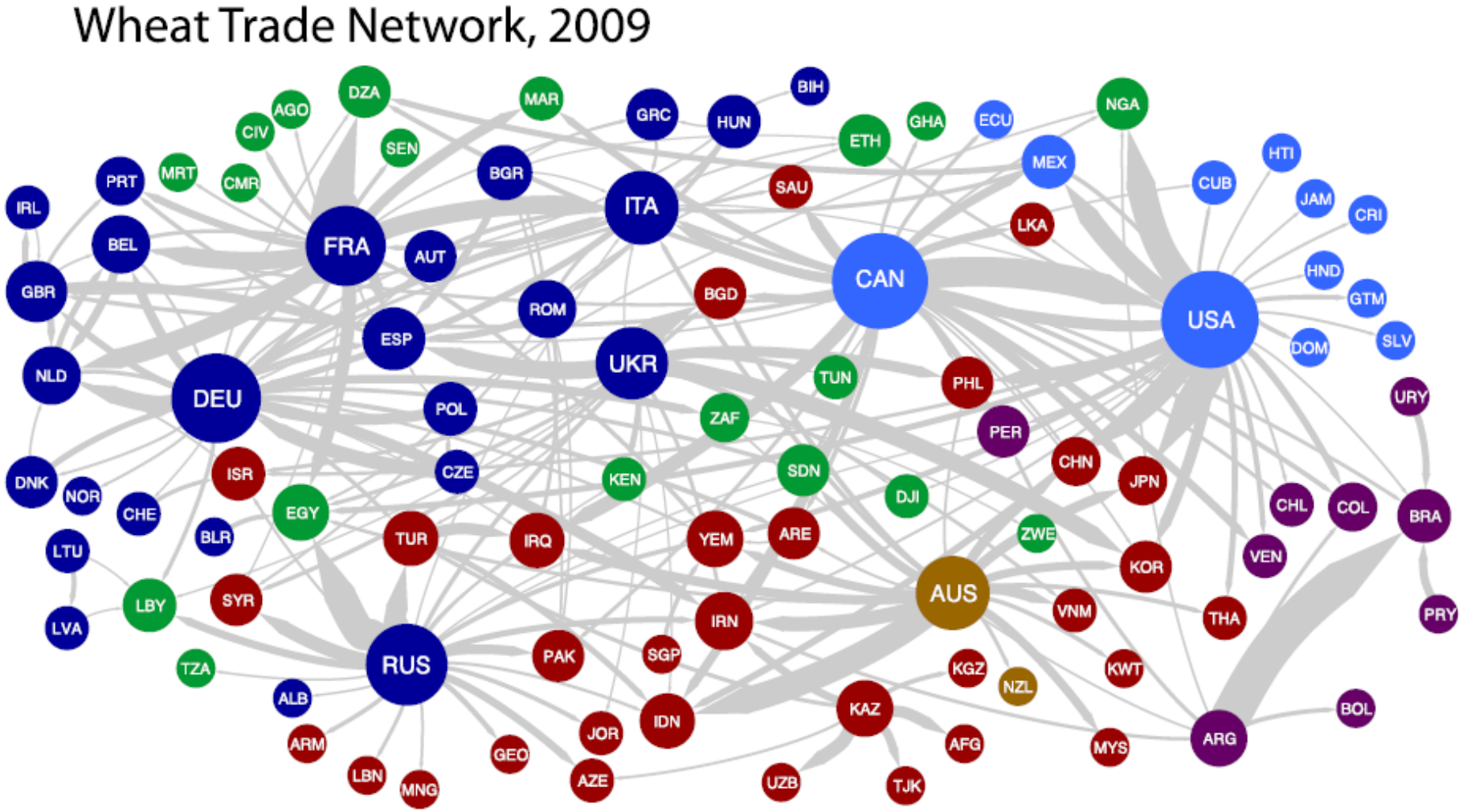
Shocks can hit many food system links



Many complex connections

Actors behave differently under stress



Puma et al., 2015

Key inputs and outputs in connected systems

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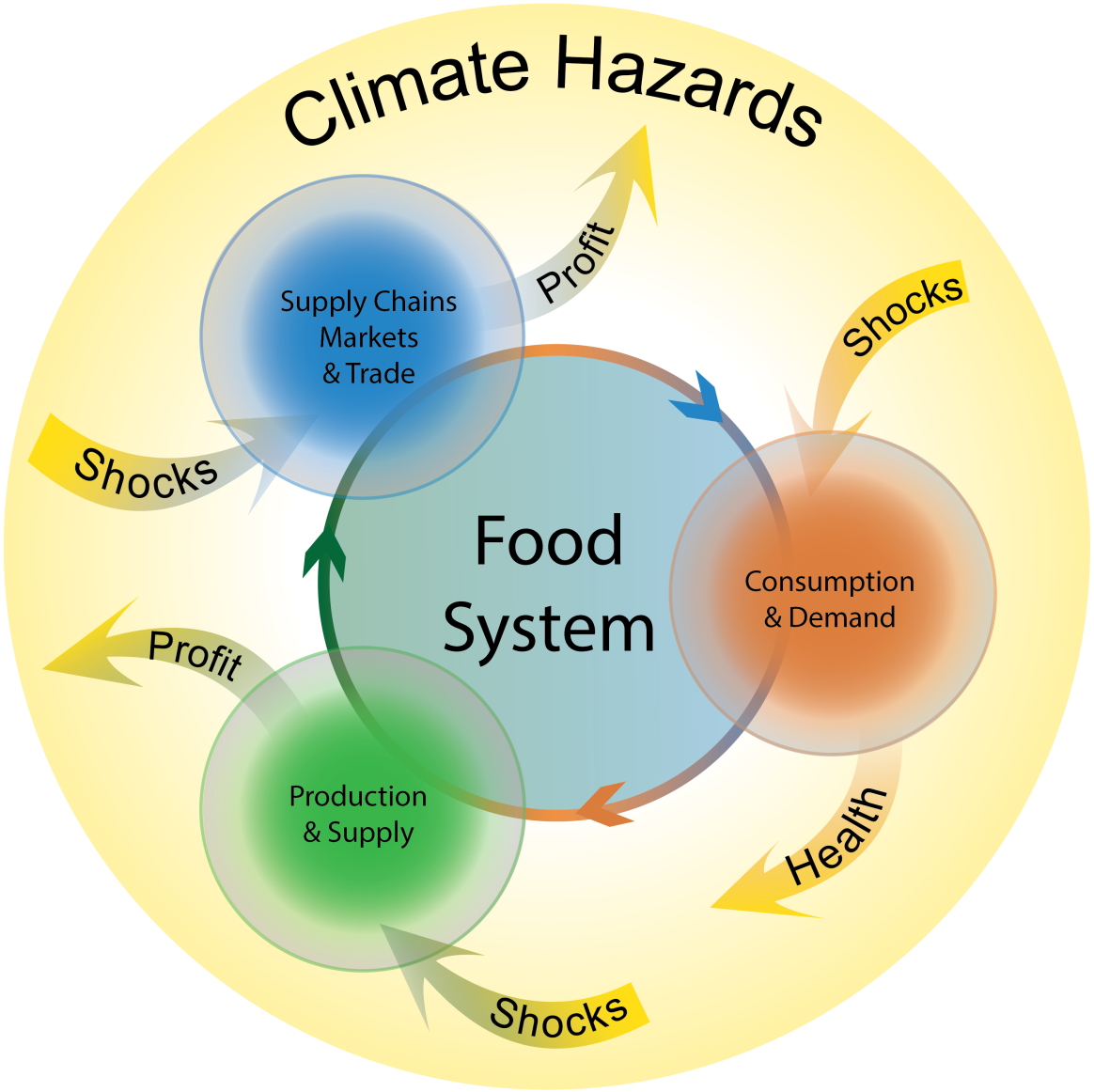
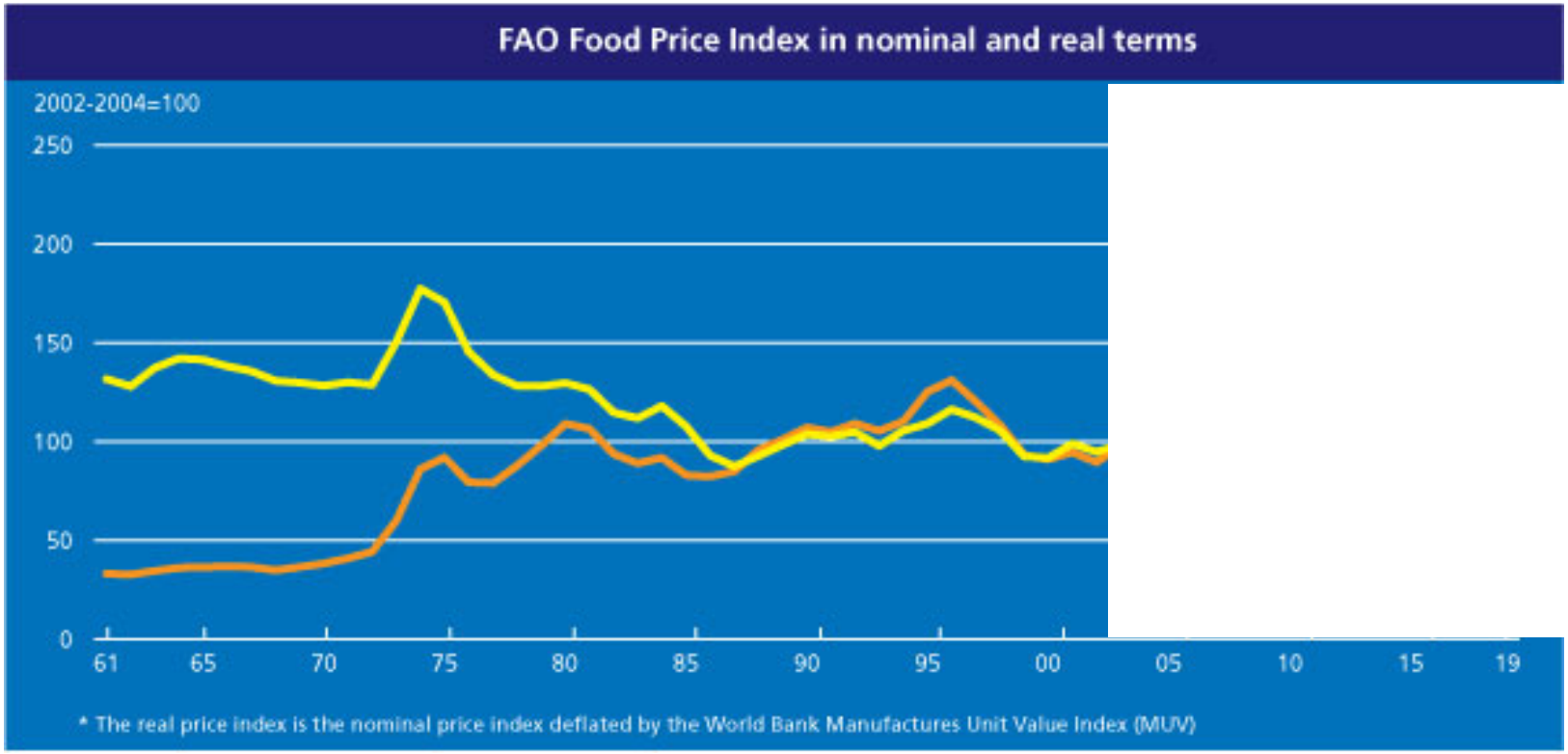
Food Shocks alter motivations



World Food Price Index



FAO Food Price Index 1961-2019
2002-2004 = 100; FAO, 2018

Assumption of perpetually declining food prices now called into question.

Spikes due to: poor climate in some production regions, energy price spikes, declining food stocks, trade policy, expansion of biofuels

Consequences: increased number of malnourished, shift in diets, reduced spending on other essentials, gender-based outcomes, social unrest, migration

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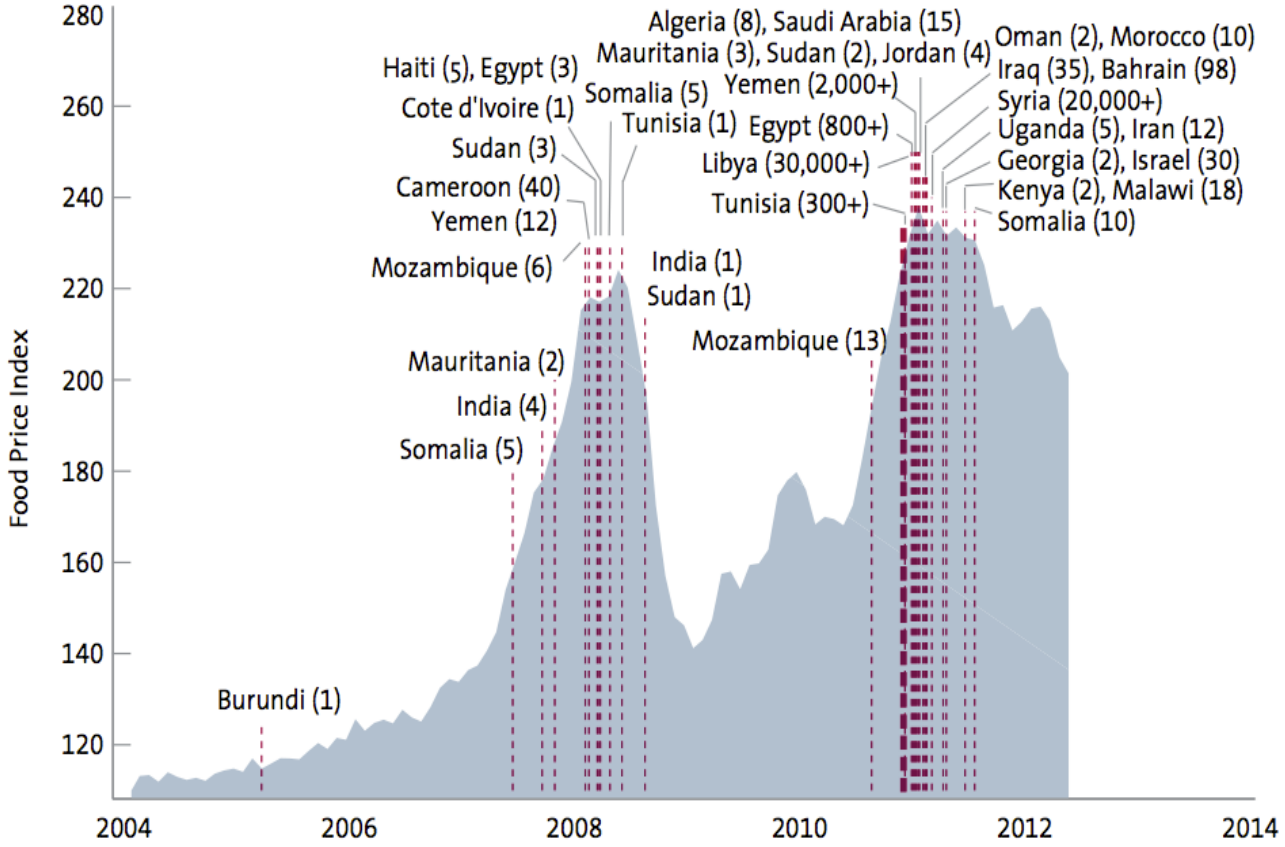
Food price spikes can exacerbate instability

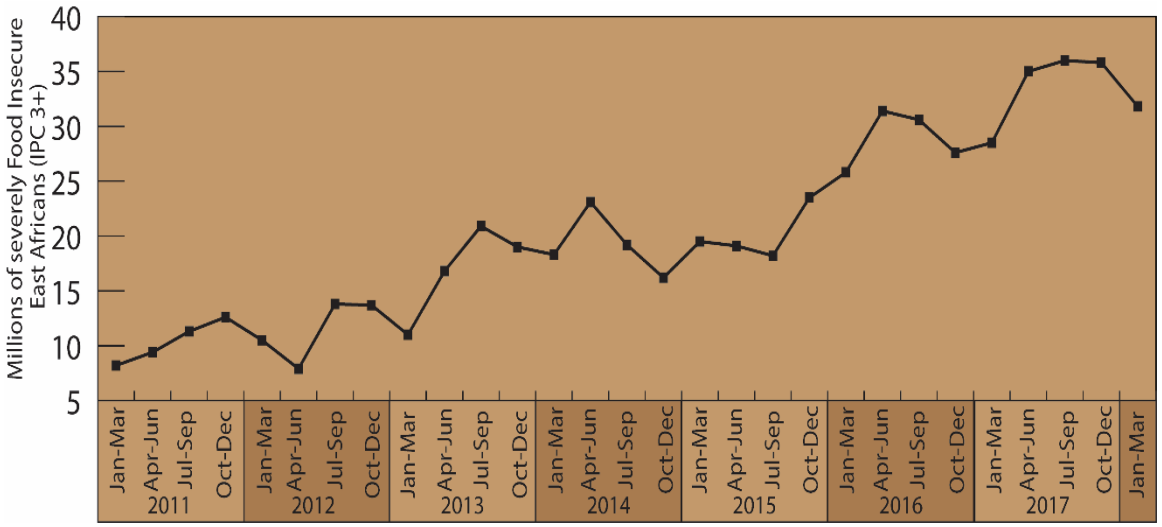


Red dashed lines correspond to the beginning dates of "food riots" and protests in North Africa and the Middle East between 2004 and 2011. The overall death toll is indicated in parentheses next to each country.

Source: Lagi, Bertand, Bar-Yam 2011.

Food Security

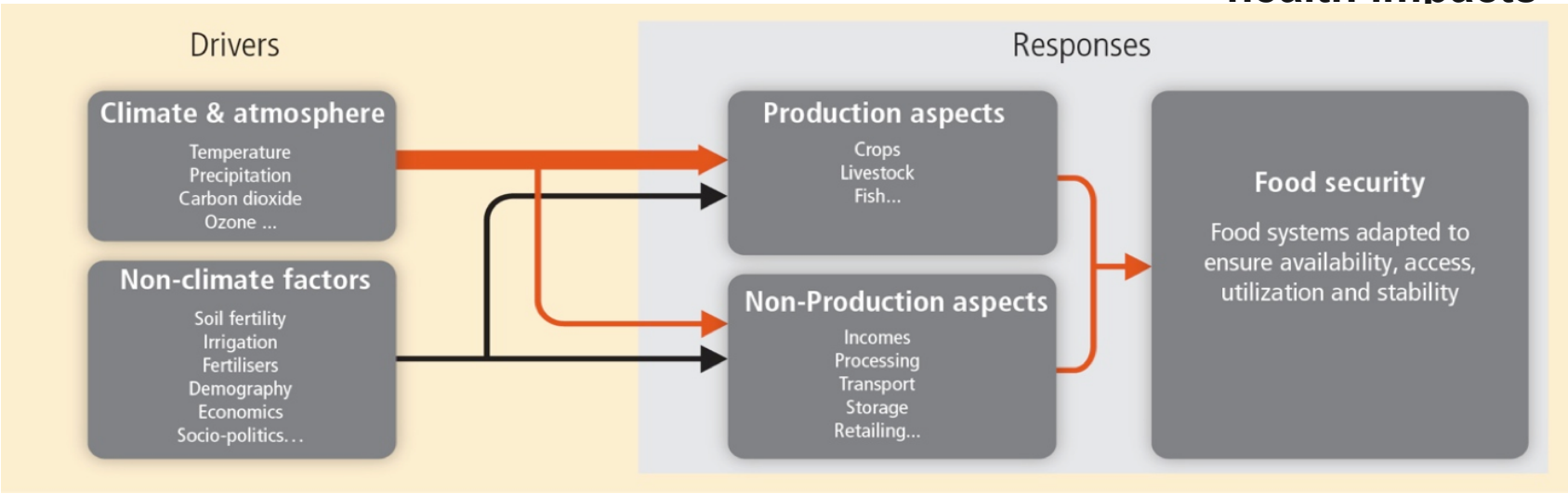
Availability, Access, Utility, Stability



Millions of severely food insecure East Africans

Funk et al., 2019

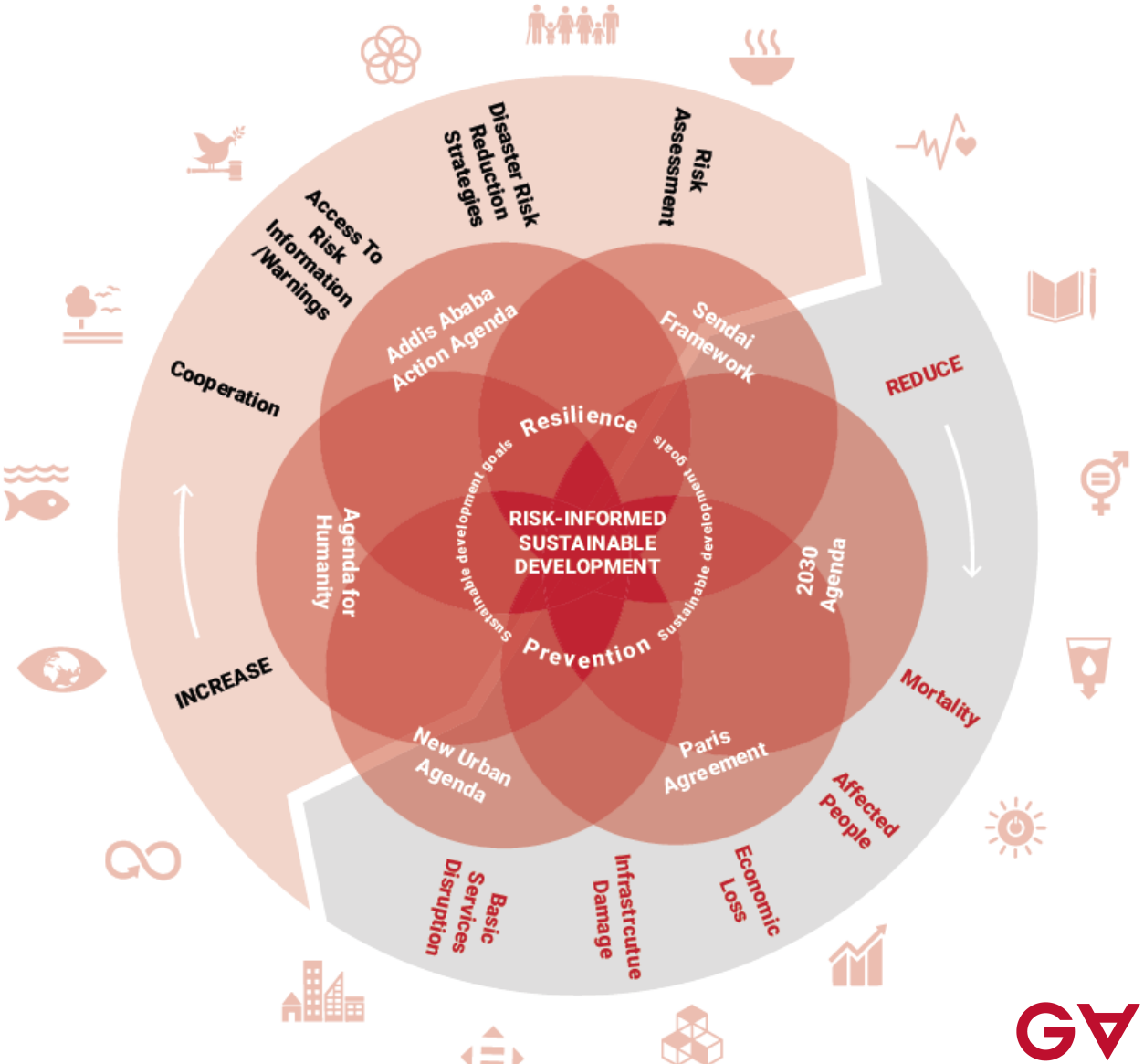
- **Impact varies widely across region and population**
- **Short- and Long-term health impacts**



Source: IPCC AR-5, WGII, Ch 7.

Complex (and non-static) Systems

Different motivations among actors and time horizons

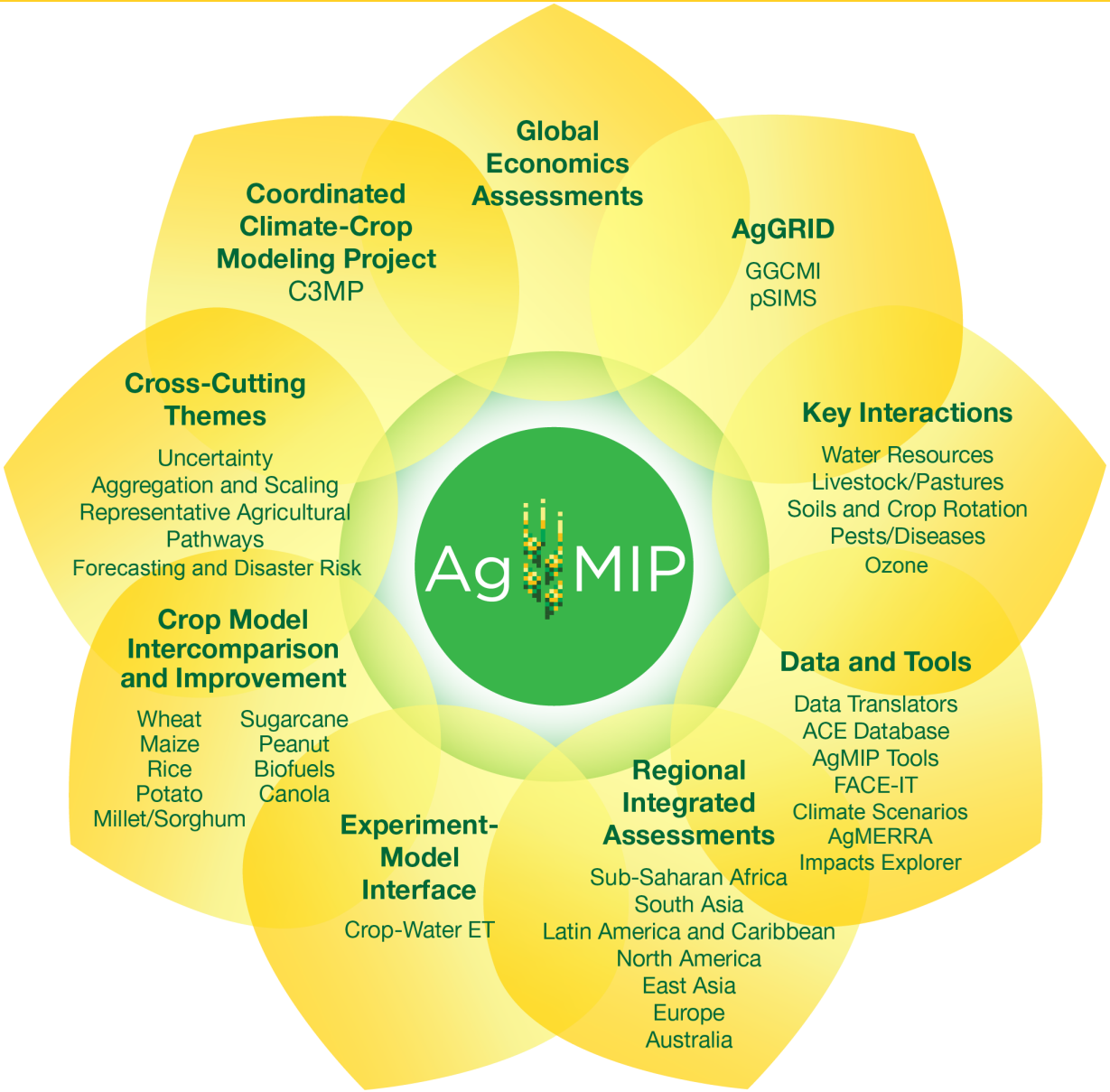


GAR

The Agricultural Model Intercomparison and Improvement Project (AgMIP)

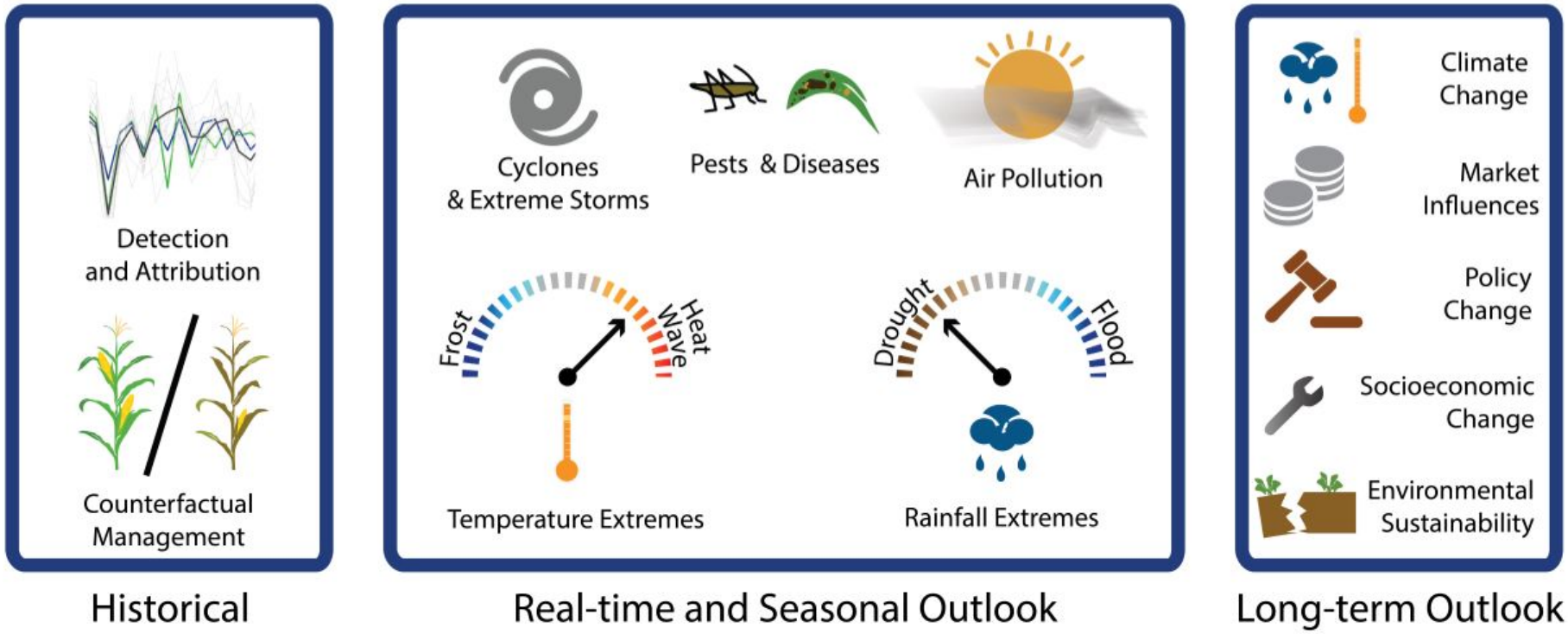
AgMIP The Agricultural Model Intercomparison and Improvement Project

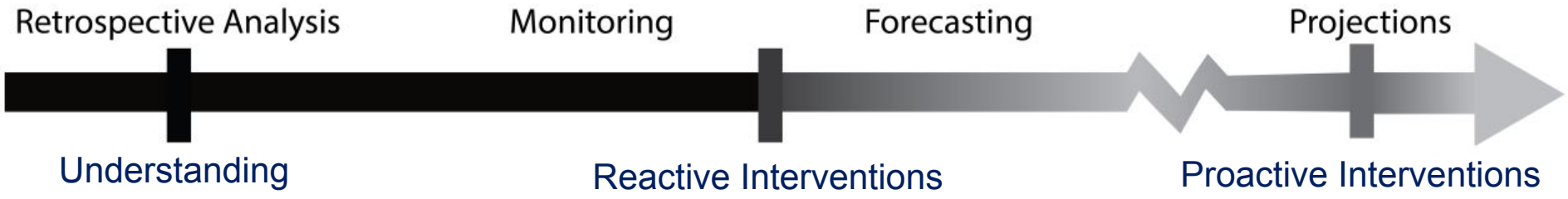
AgMIP's 30+ Initiatives



AgMIP is an international community of 1000+ **climate scientists**, **agronomists**, **economists**, and **IT experts** working to improve assessments of **current and future risks to food security** in order to **build a more productive, sustainable, and resilient future**

Adaptation-oriented Applications across Time Horizons



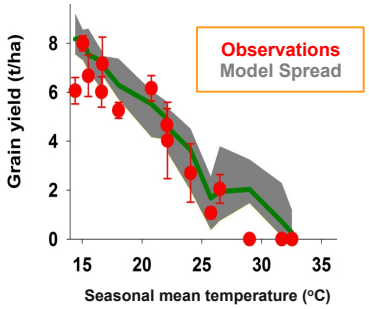


Ruane et al., in prep.

Fundamental Climate Responses from AgMIP Crop Species Pilots

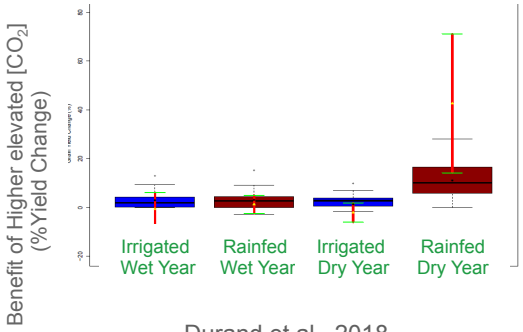
Multi-site, multi-model AgMIP climate response studies have now been published for wheat, maize, rice, potato, canola, and sugarcane

Wheat Response to T



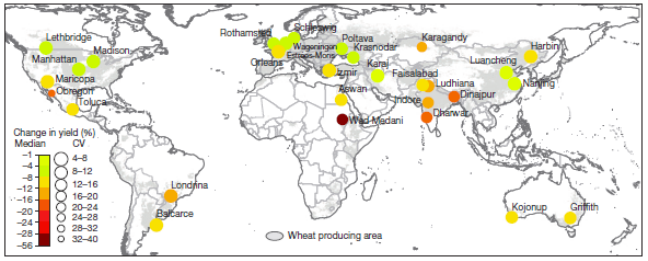
Asseng et al., 2015

Maize response to CO2 and Precipitation



Durand et al., 2018

Global Wheat Yield Response to +2 C Warming



Asseng et al., 2015

Progressive levels of investigation

- Fundamental model processes
- T, CO2, P → combinations → adaptation
- Site based intercomparison → global survey → designed global network

We need more crops, sites, and model participation!

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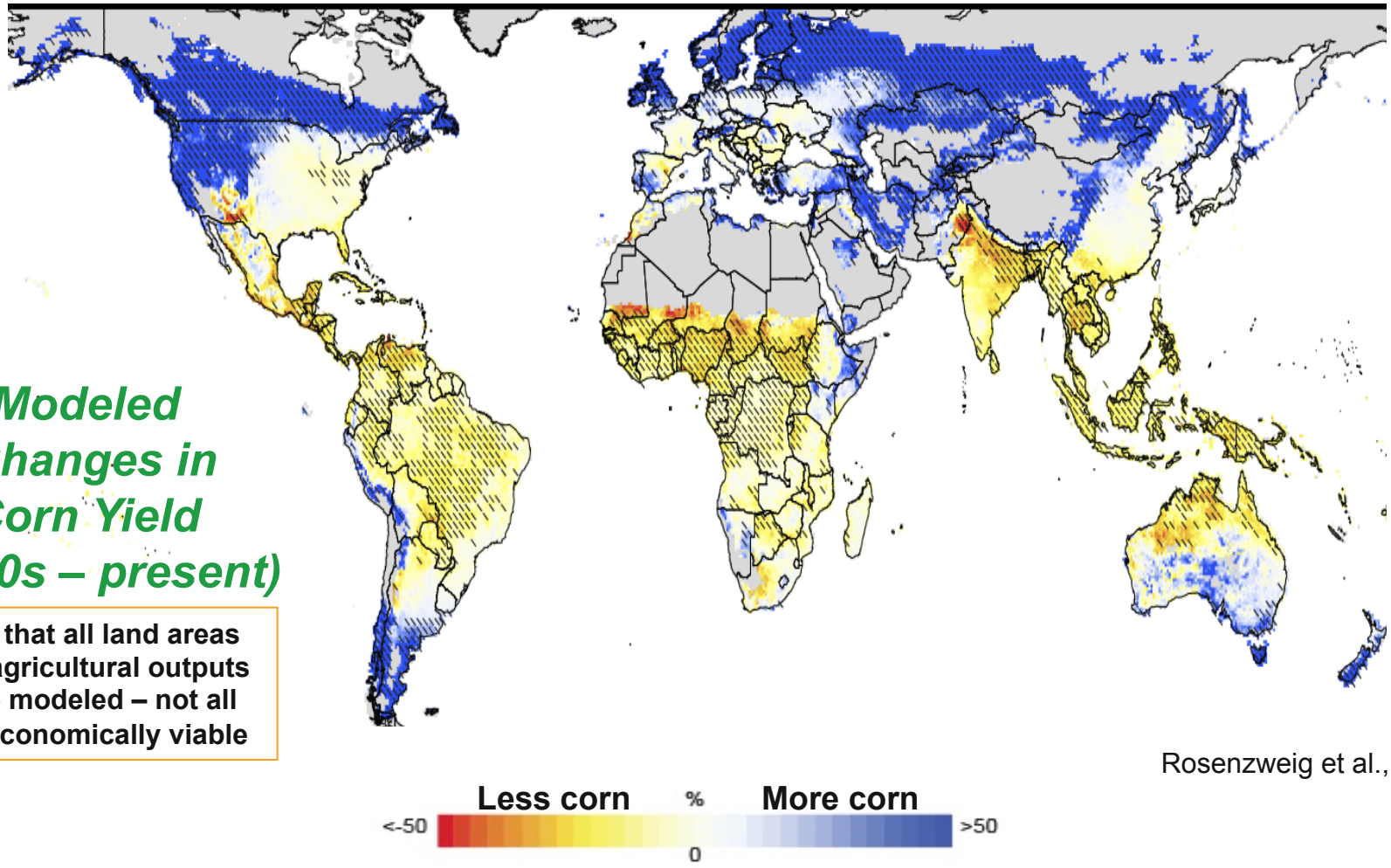
Agricultural Impacts from Climate Change
Climate & Crop Ensemble Projections



Modeled Changes in Corn Yield (2080s – present)

Note that all land areas with agricultural outputs were modeled – not all are economically viable

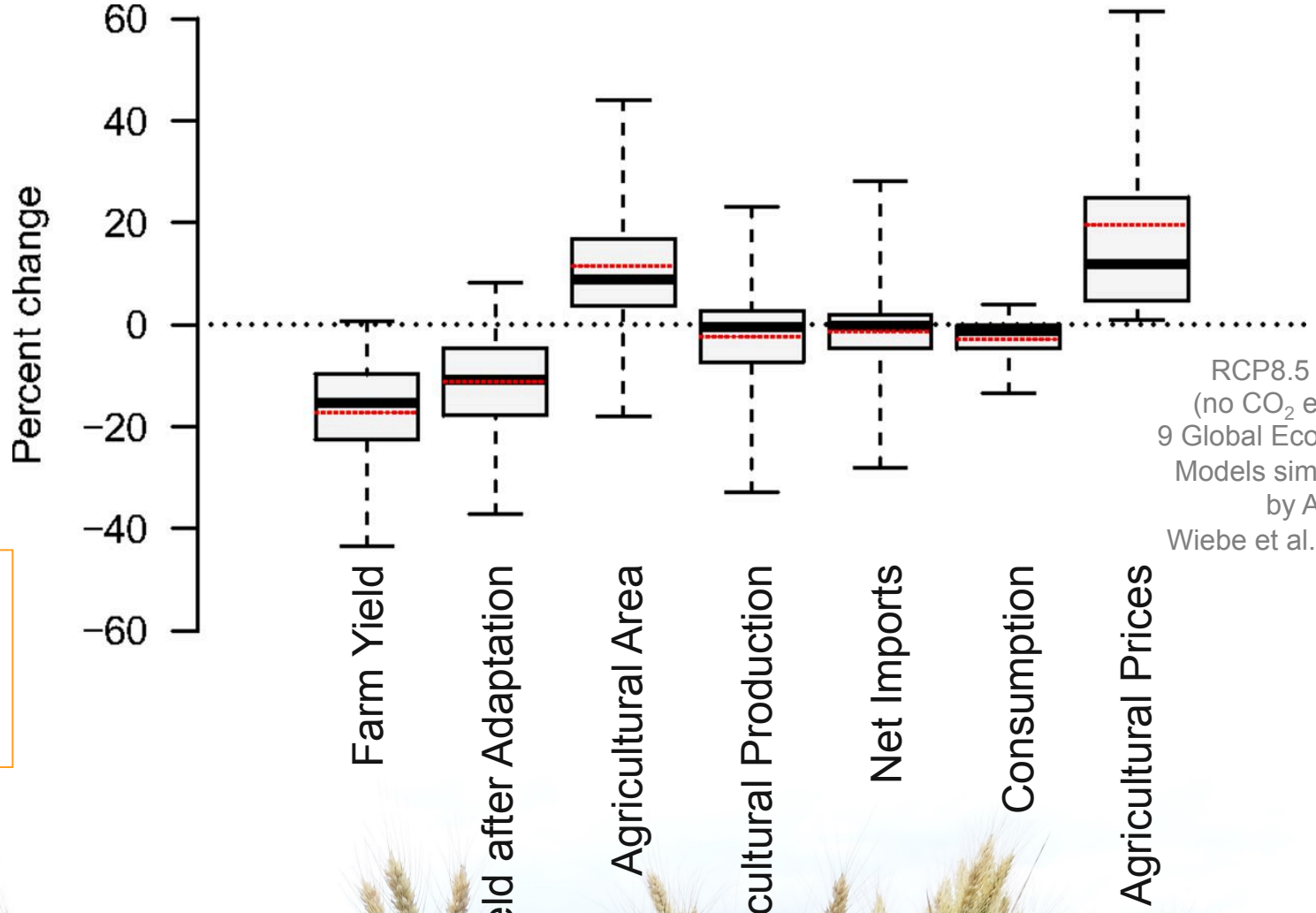
Rosenzweig et al., 2013

5 GCMs, 7 GGCMs; hatched = 70% agreement in sign of change

ISIMIP3 coming soon!

Global Economic Responses

Global Economic Model Results

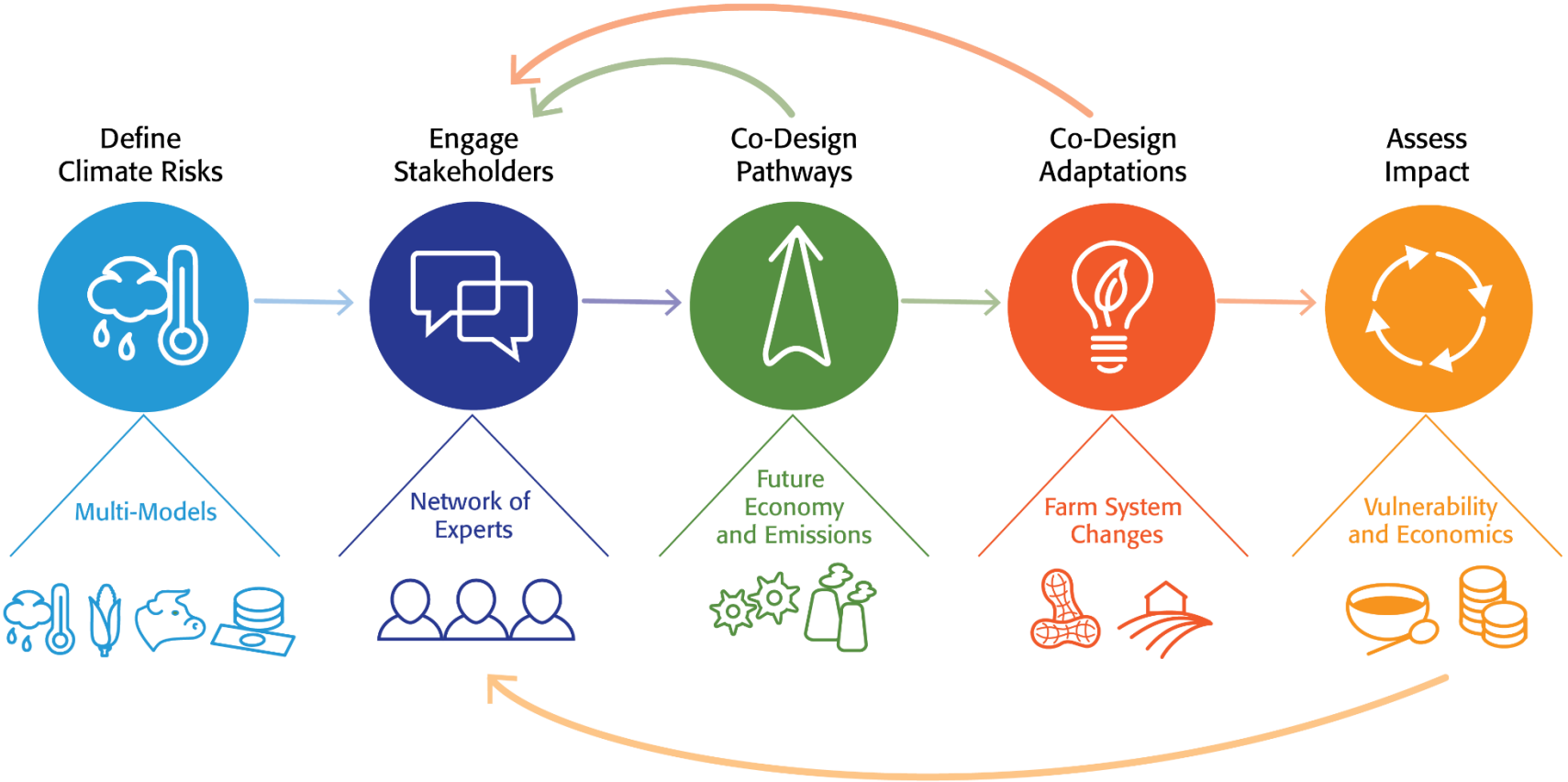


RCP8.5 2050s (no CO_2 effects) 9 Global Economic Models simulated by AgMIP; Wiebe et al., 2015

Future with climate change vs. Future without climate change

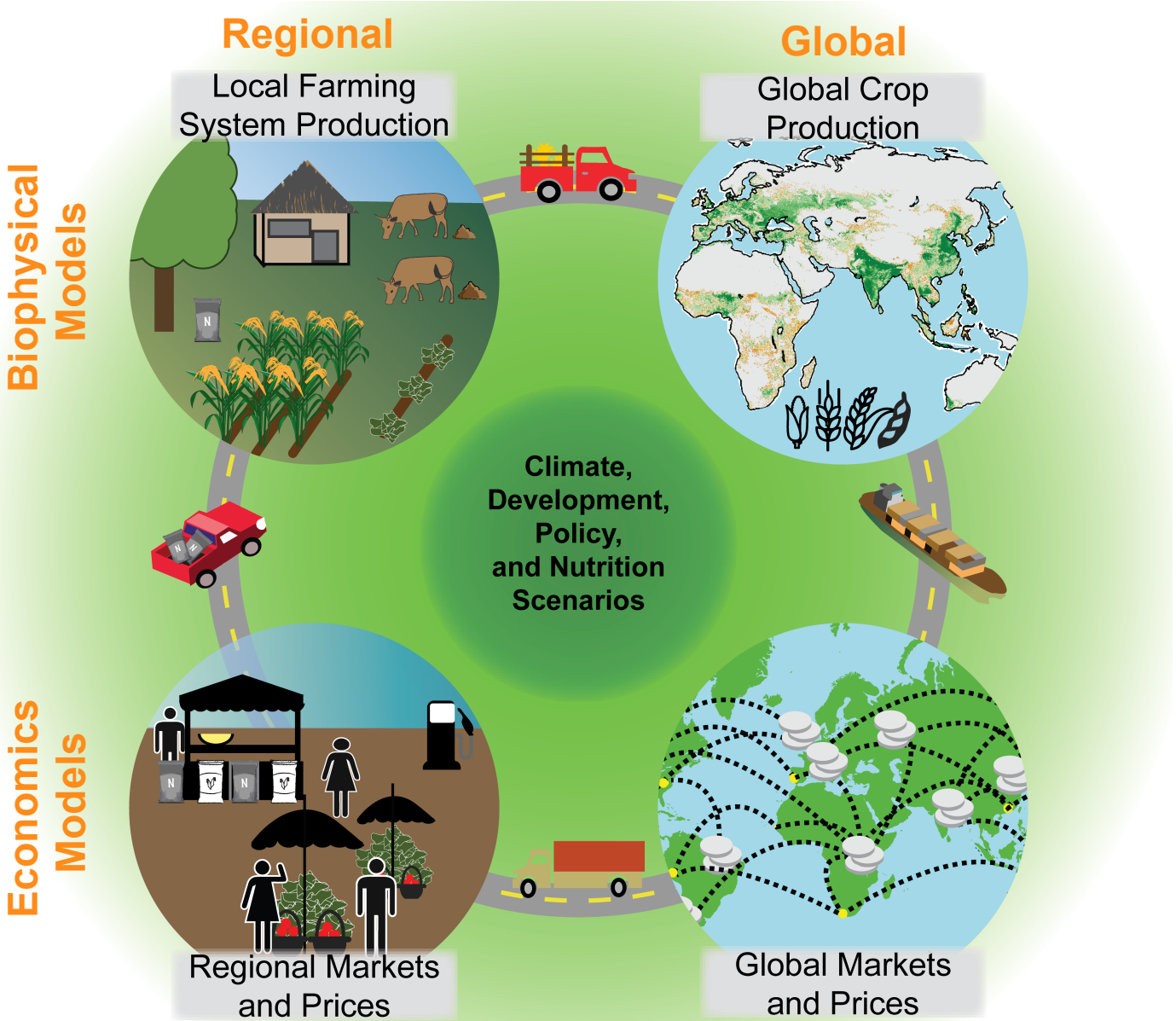
Engaging Stakeholders around the Nature of Future Agricultural Systems

Regional Economic Modeling



AgMIP/DFID, 2018

Coordinated Global and Regional Assessment Captures Multi-disciplinary and Multi-scale linkages of Global Food System



Ruane and Rosenzweig, 2019

(CGIAR Foresight)

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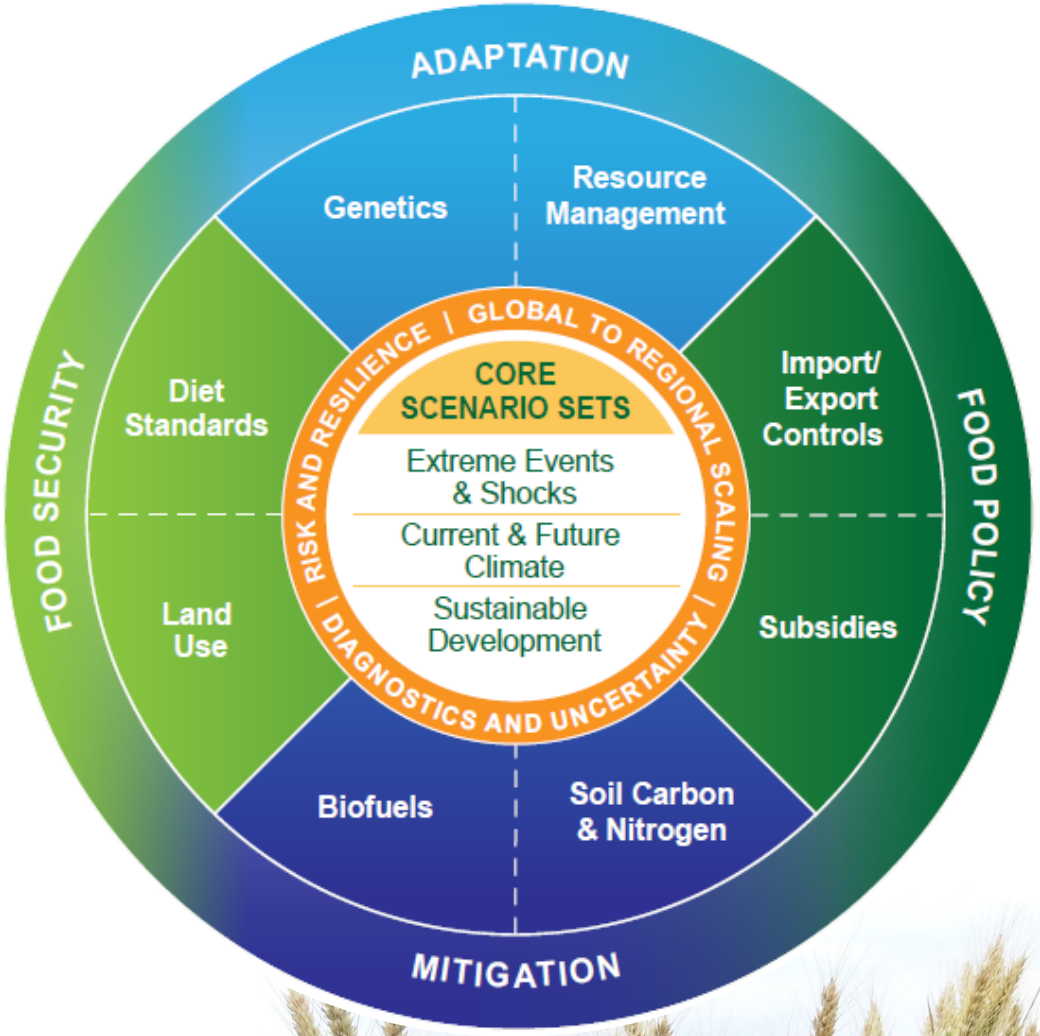
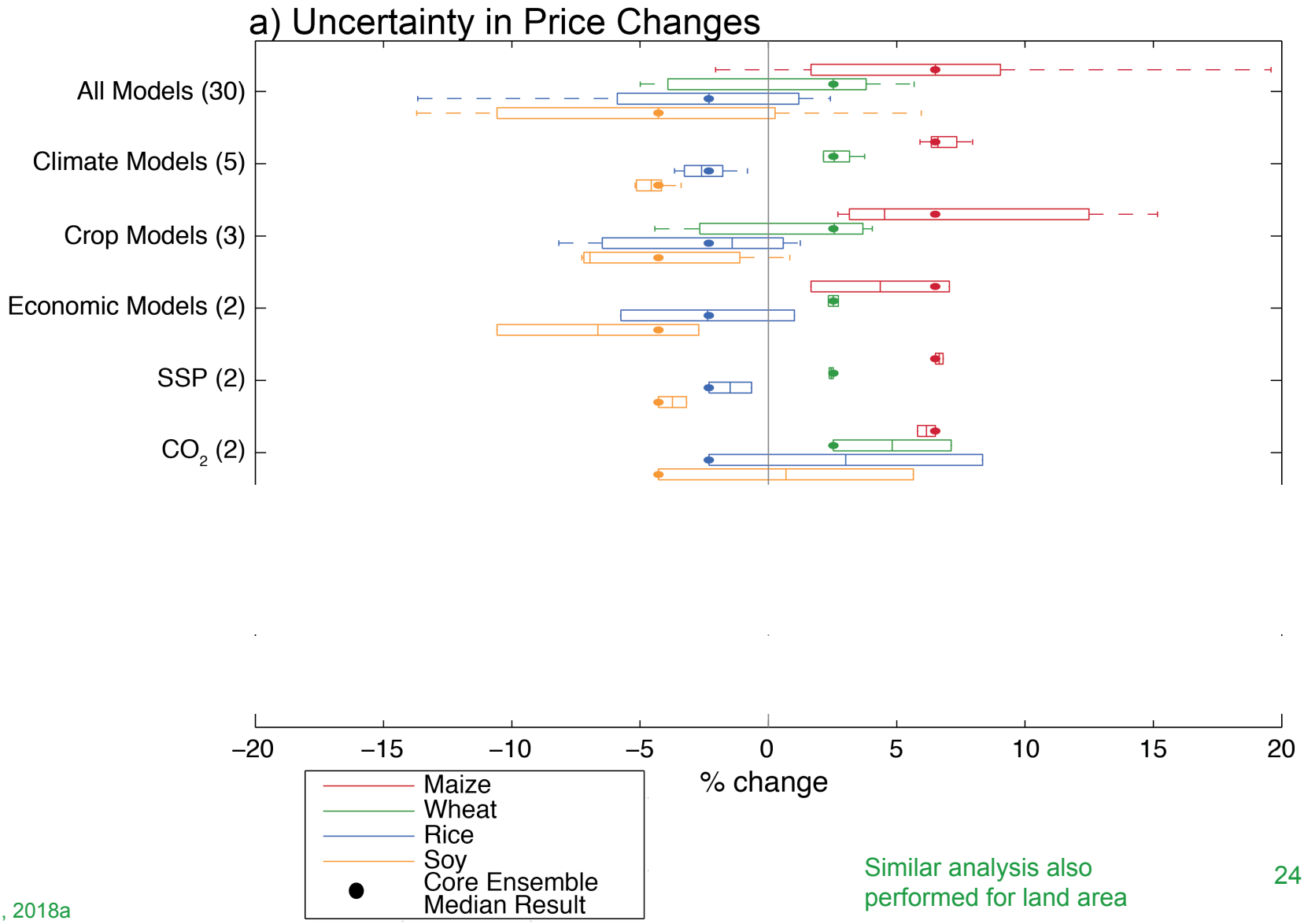
Major application areas and core elements



Built off of 2016
AgMIP / AGCI Workshop

Rosenzweig et al., 2016

Understanding Uncertainties in Modeling Frameworks



Similar analysis also performed for land area

Ruane et al., 2018a

The AgMIP Impacts Explorer:
Sustained Stakeholder Engagement and Decision Support

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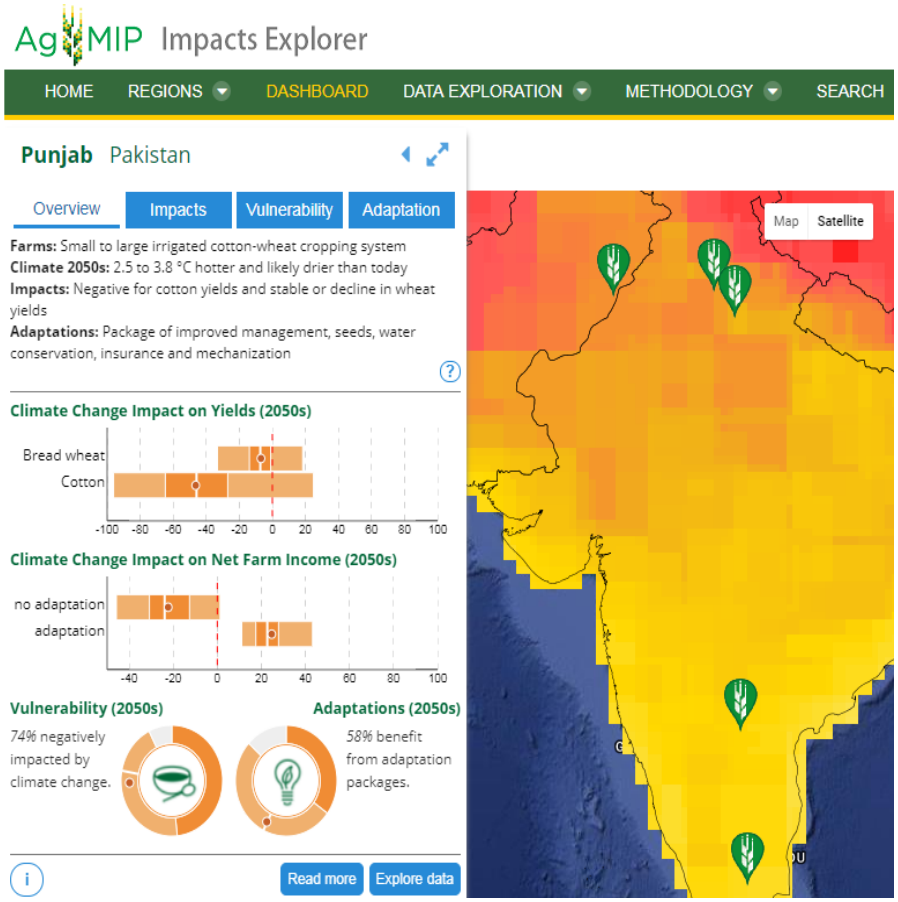
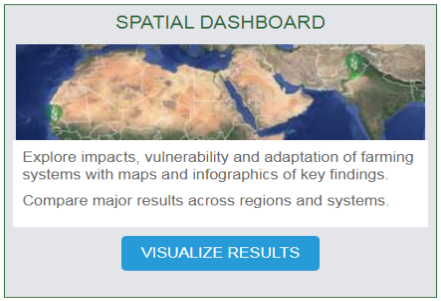
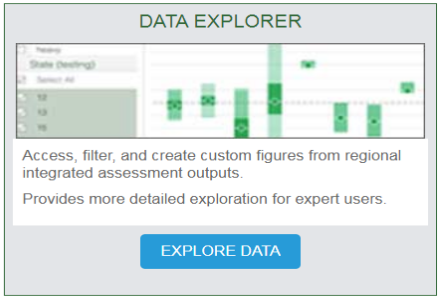
Presents AgMIP results through key messages, maps, infographics, and 'sandbox' data explorer to engage a variety of stakeholder interests and



Regional Integrated analysis for 15 countries in Sub-Saharan Africa and South Asia

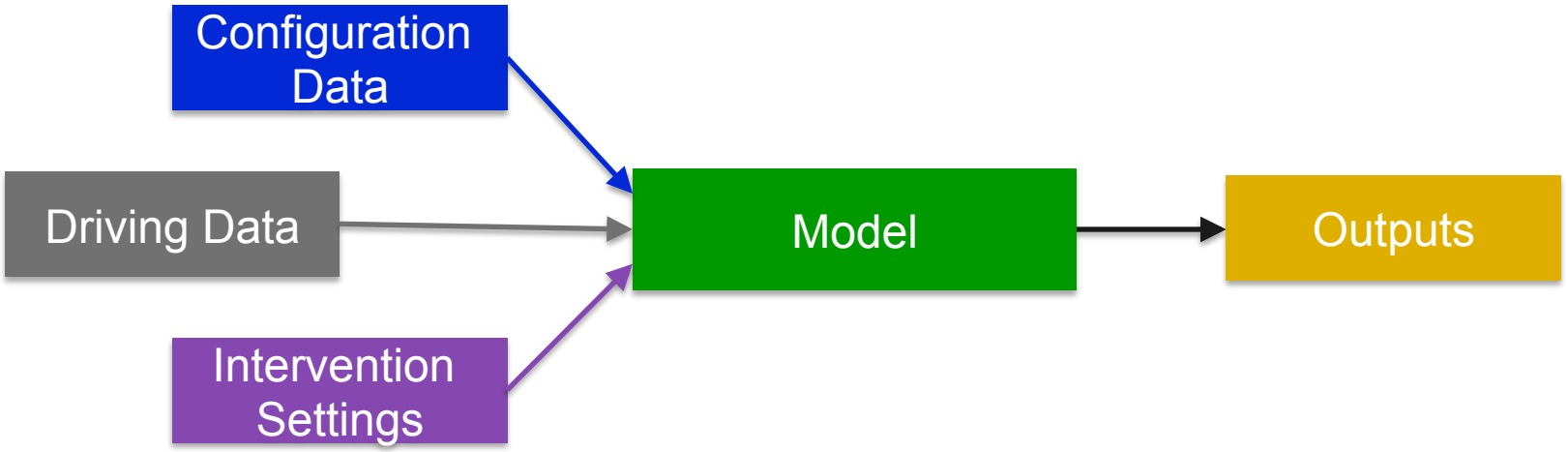




DFID Department for International Development

Linking Models for Societal Benefit

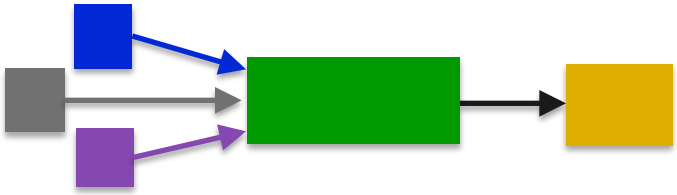
Model Connections



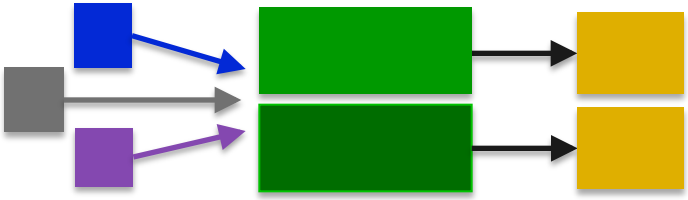
Model Connections

Further details needed for coupled systems and gaps

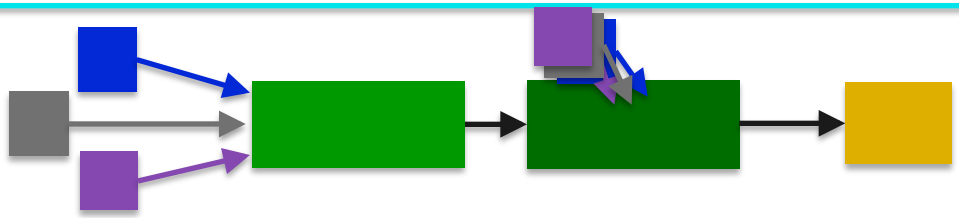
Standard Model



Multi-Model

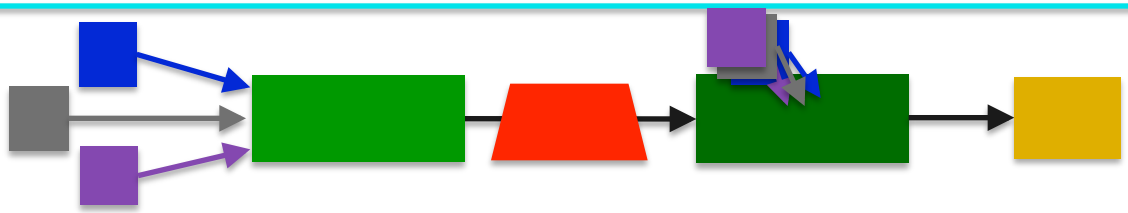


Direct Linkage



Overlapping Linkage

Translator needed for linkage



The Week Ahead

Workshop Objectives

1. **Identify aspects of food systems that introduce critical vulnerabilities.**

2. **Explore food shock decision contexts that would benefit from better scientific information and policy approaches.**

3. **Develop modeling approaches, data sources, and model-data protocols for food shocks.**

4. **Tailor planning with perspective on anticipatory (resilience) and reactive (responsive) adaptations to food shocks.**

Key Questions and Products

Key Questions

- **What do decision makers need from modeling community?**
- **How can we best utilize current community knowledge and resources to address food system shocks?**
- **What could we have in 5 or 10 years that would allow us to better inform decisions around food shock response and resilience?**
- **What are critical steps in pathway to build that next generation system?** ***("if we had X, we could do Y")***

Products

1.White Paper → Perspectives piece and research agenda for publication

2.Specific proposals for next-generation food shock modeling and decision support

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Agenda at a Glance

Monday

- **AM: Introduction, context and stakeholder perspectives**
- **PM: Stakeholder perspectives (continued), key challenges *(+ reception)***

Tuesday

- **AM: Model capabilities and possibilities**
- **PM: Model approaches (continued), opportunities for next-generation**

Wednesday

- **AM: Decision contexts and decision support**
- **PM: Excursion *(+ public event and lecture)***

Thursday

- **AM: Application approaches and Framework Development**
- **PM: Development of case studies and proposals**

Friday

- **AM: Framework refinement and path forward**
- **PM: *[Adjourn]***