

## Regional Integrated Assessment of Climate Change Impacts, Vulnerability and Adaptation of Agricultural Production Systems



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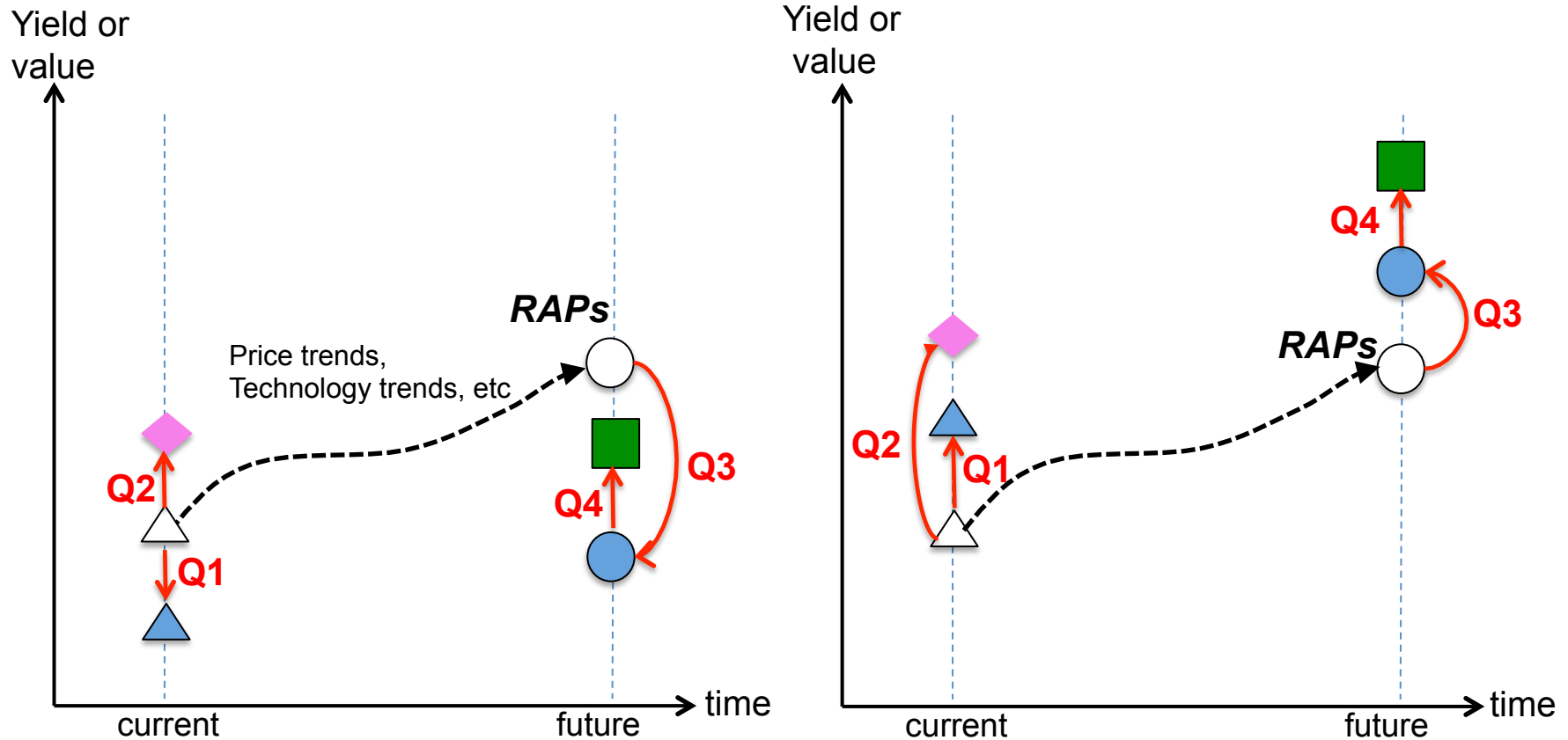
**Oregon State University  
AgMIP Regional Economics Team**

**AgMIP Coordinated Global and Regional Assessment of Climate Change and Food Security Workshop  
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- How to best use available data and models to assess future food and environmental security of farm populations – especially the most vulnerable – i.e., the small-scale semi-subsistence systems typical of the poorest regions of the world?
- How to provide better answers to stakeholders with more robust projections of climate change impacts and benefits of Adaptation? What is meaningful to Stakeholders? (poverty, food security, health, etc).
- Many Challenges:
  - Small but complex systems (crops, livestock, off-farm activities, etc).
  - Heterogeneous populations (gainers and losers)
  - Multi-dimensional outcomes: economic, environmental, social *tradeoffs*
  - Out-of-sample assessments: space and time
  - Multiple scales: sub-national, national, global
  - Data limitations: experimental survey, aggregated, modeled, expert

- **AgMIP: Need for protocol-based approach**
  - To evaluate uncertainties
  - To use ensembles (possible for econ models?)
  - To improve models
  - To address challenges mentioned above
- **AgMIP RIA methodology**
  - Pathways and scenarios (RCPs, SSPs, RAPs)
  - Global models: prices, prod trends
  - Regional models: “hybrid structural models”  
combine bio-physical & econ models

# The AgMIP RIA Core Research Questions:



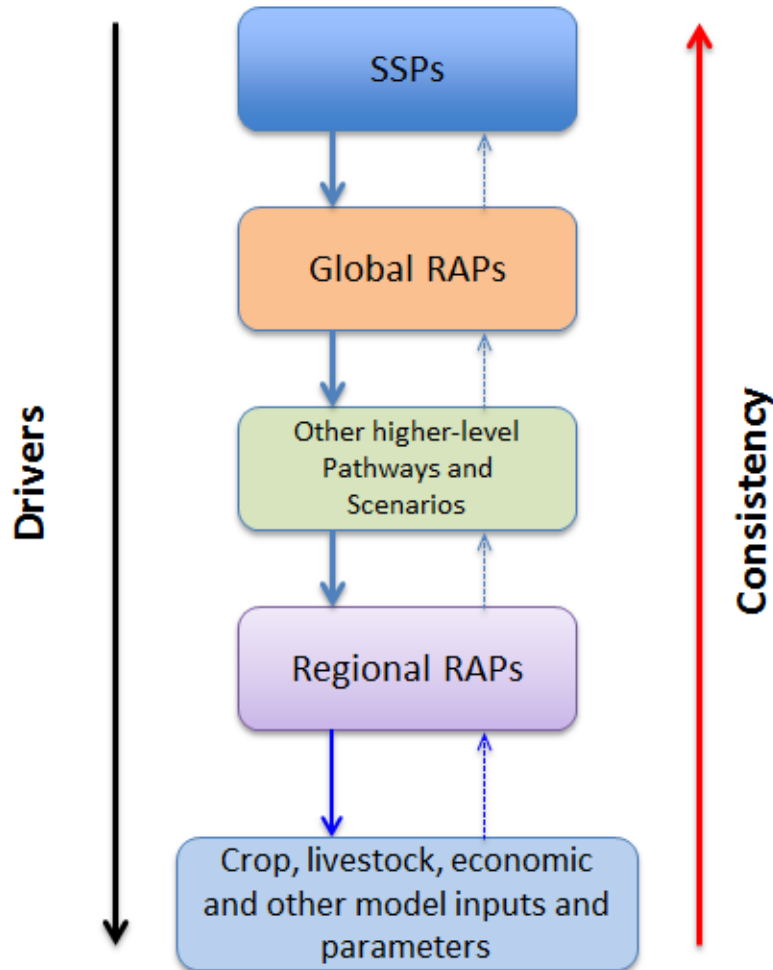
**Q1: What is the sensitivity of current agricultural production systems to climate change?** This question addresses the isolated impacts of climate changes assuming that the production system does not change from its current state.

**Q2: What are the benefits of adaptation in current agricultural systems?** This question addresses the benefit (e.g., economic and food security resilience) of potential adaptation options to current agricultural systems given current climate

**Q3: What is the impact of climate change on future agricultural production systems?** Assessment of climate impacts on the future production system, which will differ from the current production system due to development in the agricultural sector

**Q4: What are the benefits of climate change adaptations?** Assessment of the benefits of potential adaptation options in the future production system

# Linking Agriculture-Specific Pathways to SSPs: Representative Agricultural Pathways (RAPs)



-> **Hierarchical structure (nested approach)**

. SSPs: Framework for development of sectoral (e.g. agricultural) global and regional scenarios.

- Global RAPs: Global Economic Models and other non-modeled global socio-economic conditions:
  - GDP, population & policy and trade, etc
- Regional RAPs: Allow us to include key drivers are likely to affect future bio-physical and socio-economic conditions:
  - ag productivity trends, land use, policy, regional development
  - farm size, system-specific productivity & management, infrastructure, etc

**AgMIP:**  
***Developing and implementing  
Representative Agricultural Pathways and  
Scenarios (RAPs)***



## Global physical and economic water scarcity



**Sub-national**

A1a

A1b

A1c

A2a

A2b

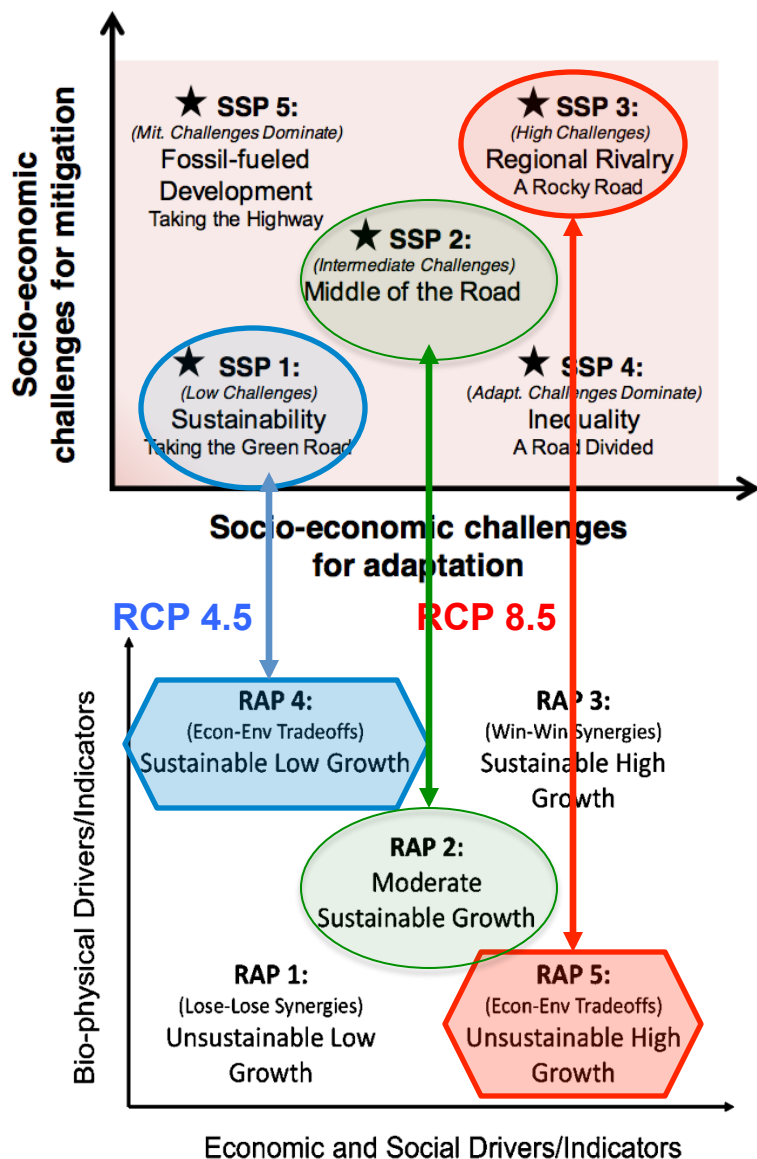
A2c

A3a

A3b

A3c

## *Future socio-economic scenarios: Linking SSPs, RCPs, RAPs and price/productivity trends to be used in AgMIP Phase II:*



**RAP 4: “Sustainable low growth (SLG)”.** This RAP will be combined with RCP 4.5 and with global economic model outputs associated with SSP1.

**RAP 5: “Unsustainable high growth (UHG)”.** This RAP will be combined with RCP 8.5 and with global economic model outputs associated with SSP3 –(or SSP5?)

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# AgMIP Regional Research Teams RAPs Trends Table: SSA (AgMIP, Phase I)

Variable	CLIP – R1 Zimb	CLIP – R2 Zimb	CLIP – R1 Mozamb	CLIP – R2 Mozamb	East Africa Embu, KE	West Africa R1 Niore	West Africa R2 Niore	SAAMIP South Africa	SAAMIP Namibia
Soil degradation									
Pest and diseases									
Extreme events									
Water availability									
Farm size									
Household size									
Herd size									
Livestock Productivity									
Fertilizer prices									
Fertilizer use									
Subsidies (inputs)									
Off-farm income									
Improved crop use									
Information availability									
Public invest in Agriculture									
Labor availability									

Direction and magnitude	
No change	
Small increase	
Moderate increase	
Large increase	
Small decrease	
Moderate decrease	
Large decrease	
Not included in RAP or under revision	

BAU Pessimistic

SSP2, period 2050



- Global models: price, productivity trends & uncertainties
- Regional models: dimensionality = GCMs x RCPs x SSPs x Crop models x RAPs x Adaptations
- Pathway/scenario uncertainty
- Scaling down, up with scenarios, adaptations
  - Adaptation: global-regional inconsistencies
  - (disaggregation, aggregation)