INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
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SCENARIOS ON CLIMATE CHANGE IMPACTS FOR DEVELOPING APEC ECONOMIES

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APEC Climate Simposium 2016

Smart Climate Information and Accountable Action: Achieving Sustanable Food Security in a Changing World. Piura, Peru 2016

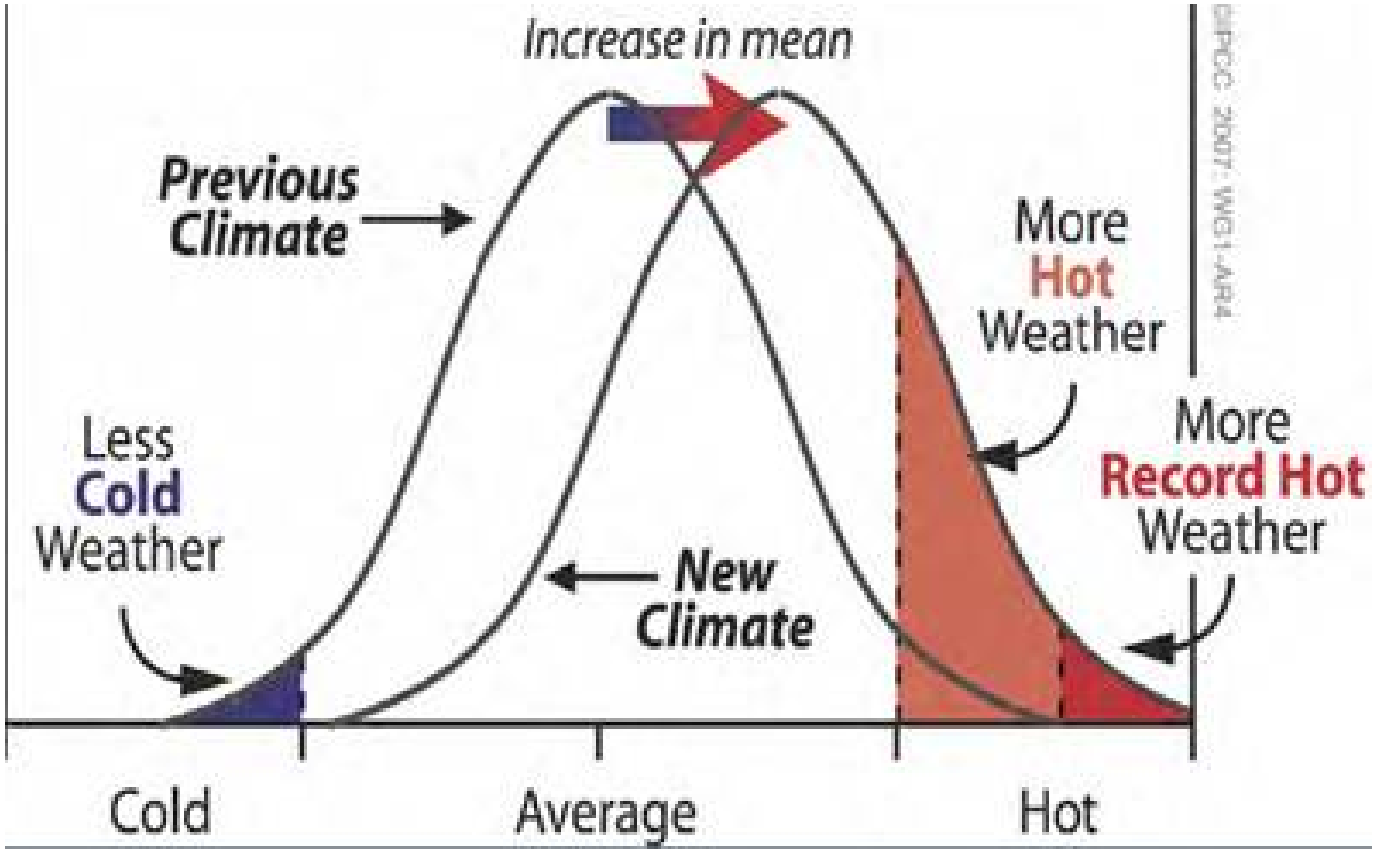
APEC
Asia-Pacific Economic Cooperation

APEC PERU 2016

Photo: S. Allen, IFPRI

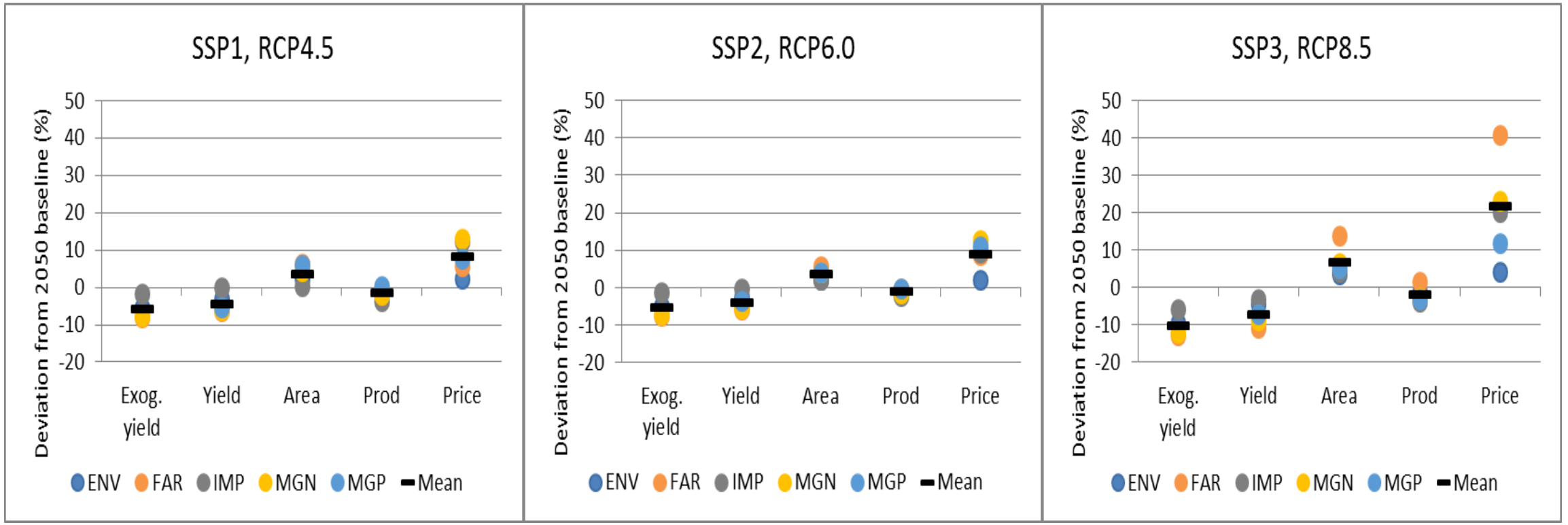
CLIMATE VARIABILITY AND RISK

- Moderate consensus that temperate regions will have increased variability in temperature and rainfall
- No consensus on tropical regions (IPCC AR4)
- But increased mean temperature increases risk



Climate Change Price Impacts
SCENARIO RESULTS

Figure 1. Impacts of climate change on global yields, area, production and prices of the 5-crop aggregate relative to baseline values in 2050 for each Shared Socioeconomic Pathway (SSP) and Representative Concentration Pathway (RCP) compared across five models



Note: ENV = ENVISAGE, FAR = FARM, IMP = IMPACT, MGN = MAGNET, MGP = MAgPIE.
Source: Work in progress by IFPRI, LEI-WUR, PIK, Purdue, USDA-ERS, IDS

Agricultural trade and Mitigation

Part of the problem…

- Trade increase emissions:
  - Trade creates markets, connecting a new demand to a new supply: it can cause severe environmental damage (direct *e.g.* timber and indirect effects *e.g.* tea plantation)
  - Trade requires to transport goods: more transportation emissions
  - *Limiting trade is a second best tool: lack of enforcing capacity to protect environment or tax transport externalities*

… Part of the solution

- Trade does not only lead to produce more, but also to produce differently, and potentially better:
  - Less energy intensive production
    - a Spanish tomato consumed in England has a carbon footprint of only ¼ of its British cousin
    - Agriculture: USA 553Kj/Kcal, Zambia 191Kj/Kcal
    - But markets need the truthiness of prices: danger of subsidies in agriculture on energy use
  - Role of technology transfer
- But trade can also promote “green” goods
  - Specific issues around Bioenergy

Agricultural trade policy: mitigation and adaptation

- Pattern of trade specialization matters for the terms of trade effects and country exposure to shocks (level and volatility)

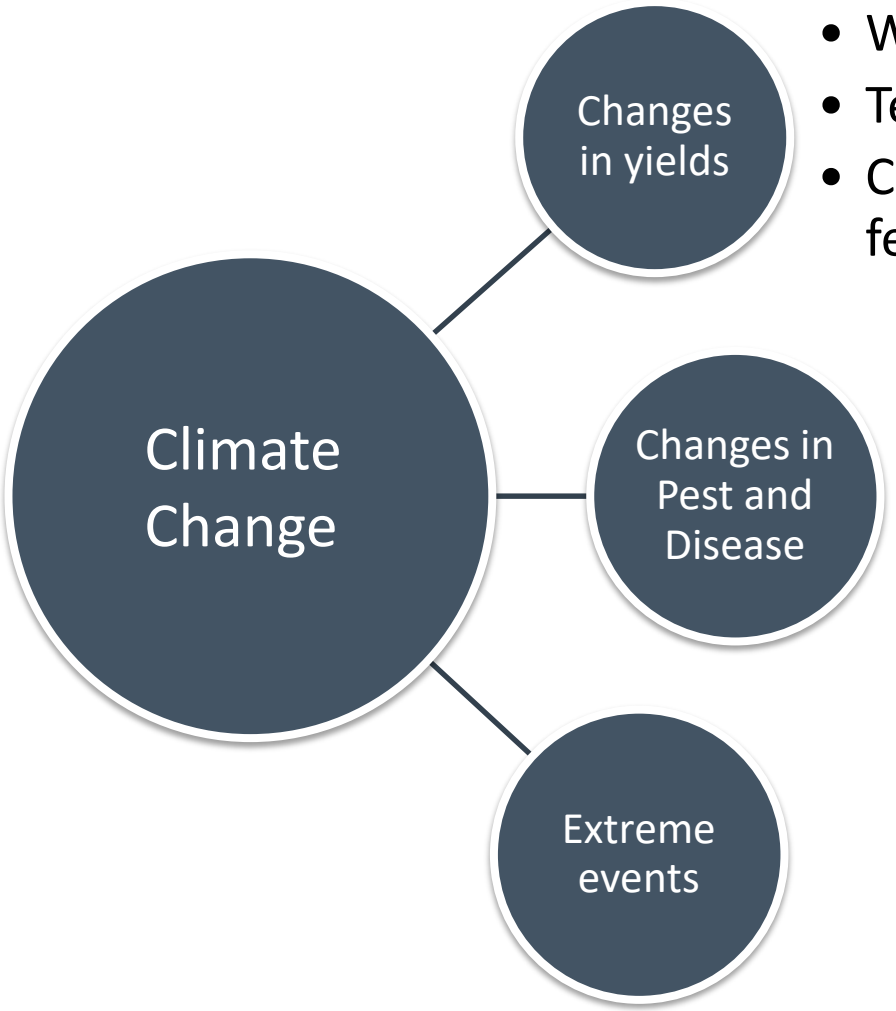
- Degree of openness and size of the markets matter: market power and terms of trade

- Therefore: trade policies matter for managing climate change
  - Short term vs long term tools

Agricultural trade and Income:
the bridge between mitigation and adaptation

- We promote trade because we want growth and inclusive growth.
- But growth has contrasted effects.
  - For the mitigation stage:
    - Without strong environmental policies: More growth = more emissions. The Environmental Kuznets Curve is not the rule!
    - Poverty alleviation is even a complex issue:
      - Poverty reduction: a powerful weapon to fight “charcoal” based economy
      - Poverty reduction: people will eat more, and more meat…
    - Political economy: More opportunity to implement new mitigation regulation with booming economies than high unemployment
  - For the adaptation stage:
    - Strong growth, combined with structural changes, the best adaptation strategy
      - Large investments in R&D and Infrastructure for coping with CC in agriculture

Climate change and Agriculture: what can we quantify in agriculture?



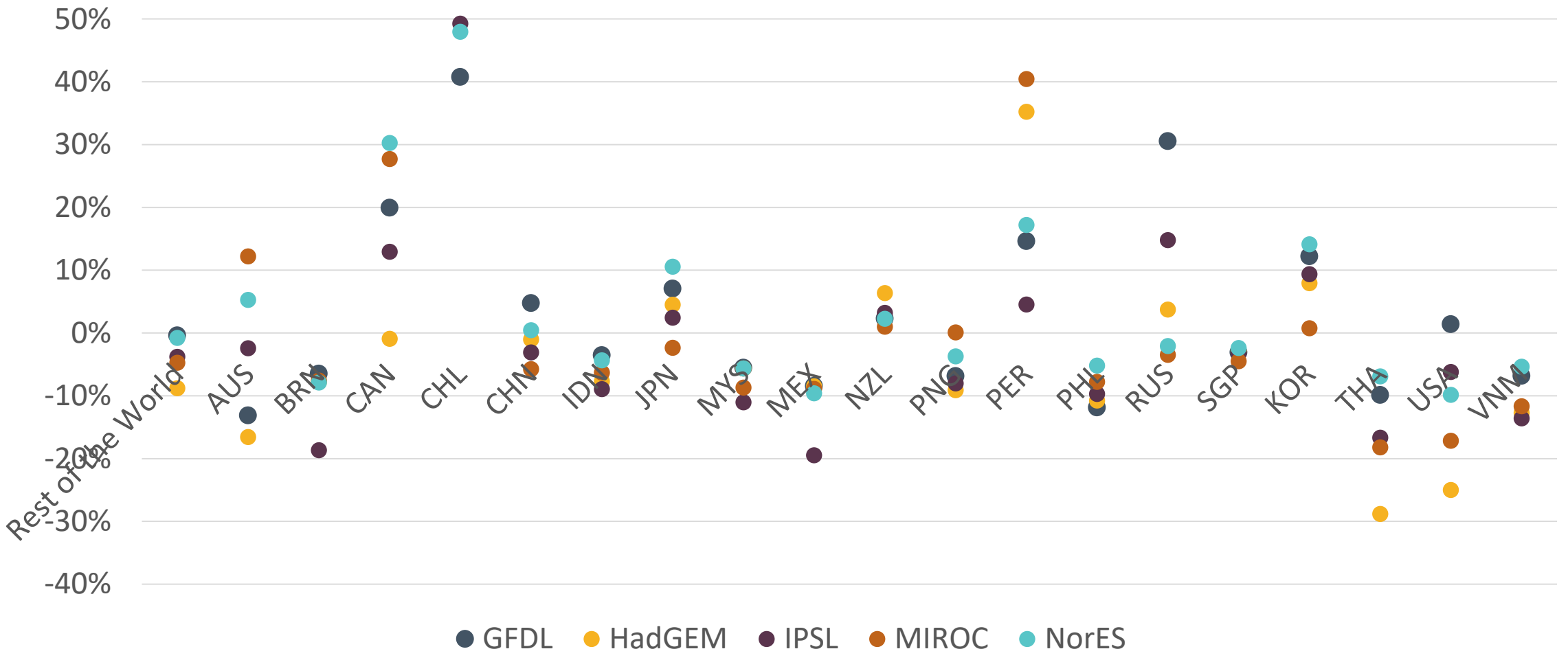
- Water
- Temperature
- CO2 fertilization

Climate models:
Global Circulation Models → changes in weather patterns
(here 4 different models will be used)

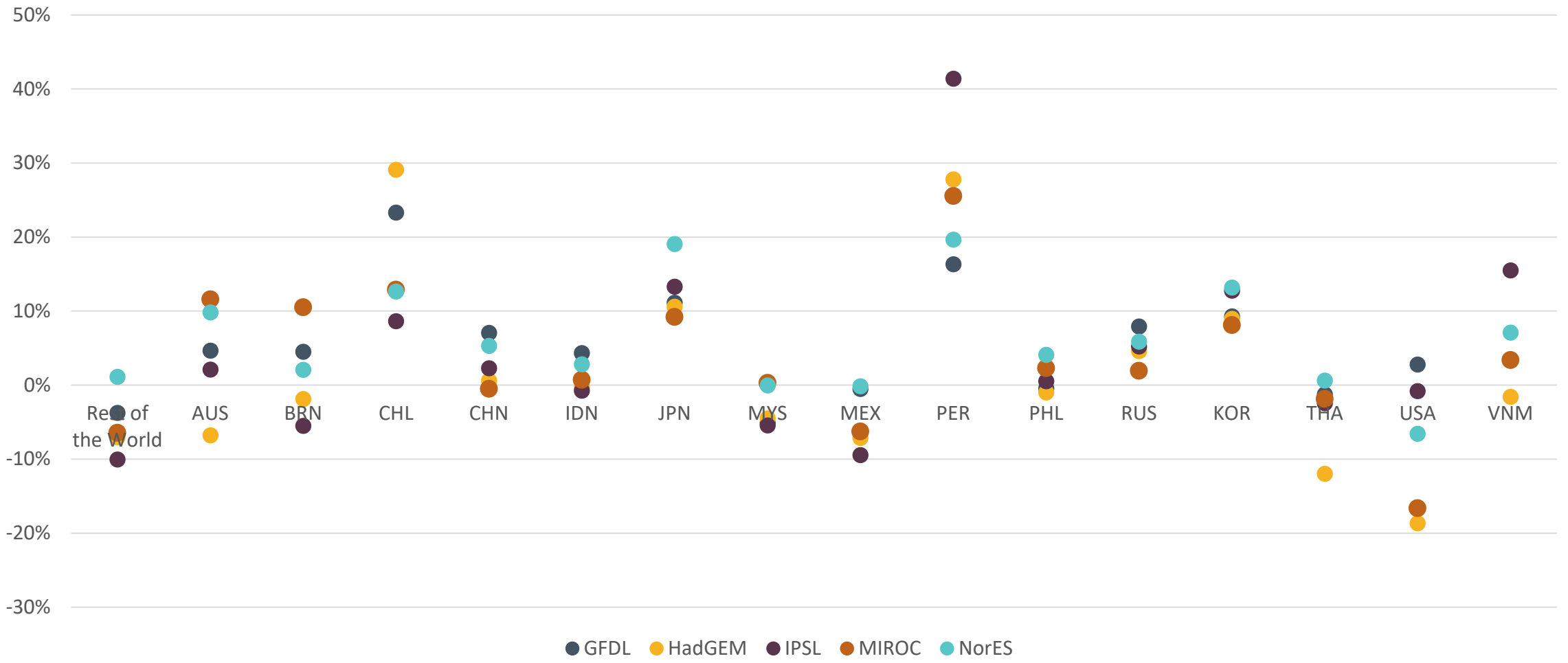
Agronomic models:
Crop models → changes in yields at constant economic conditions
(here different models will be used based on AgMip)

Economic models:
Impact on the economic systems, feedback of investments, specialization…
(here we use the MIRAGRODEP CGE)

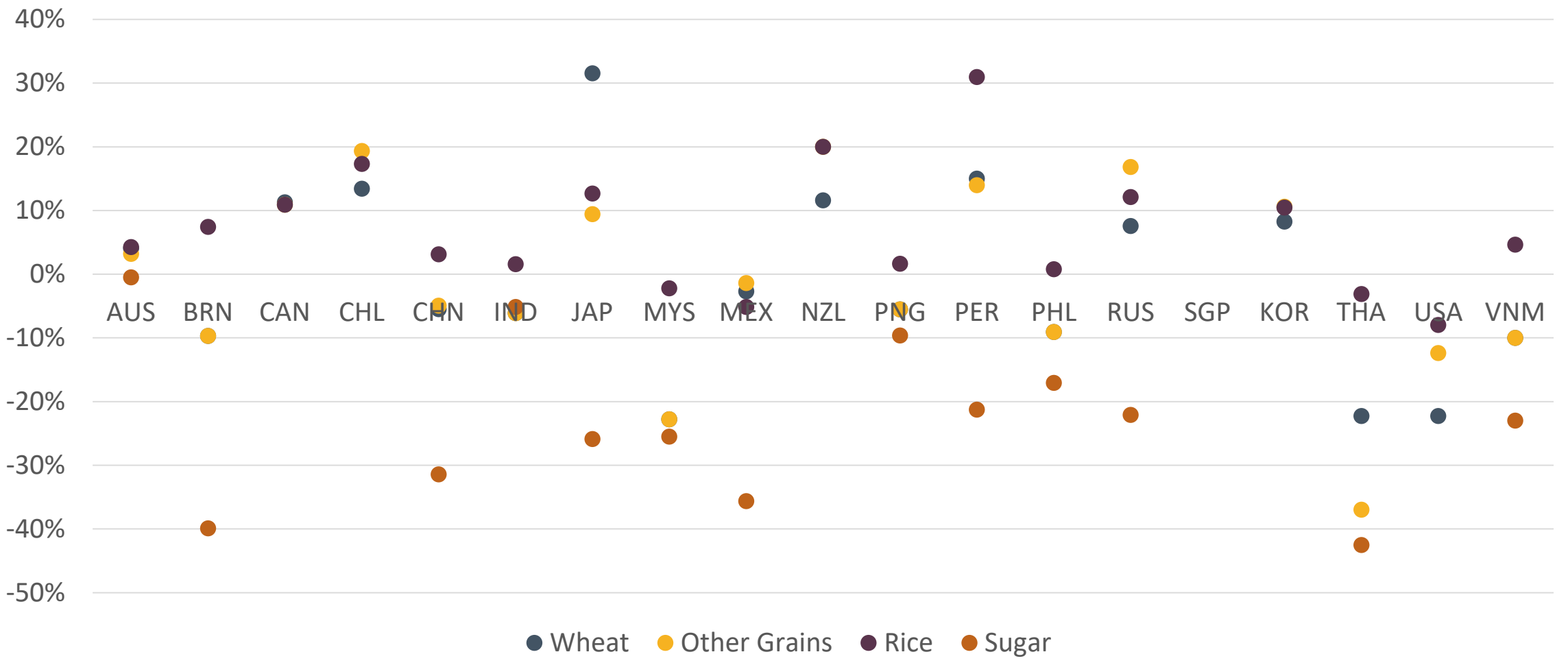
Heterogeneous projections
Illustration Maize – Rain fed



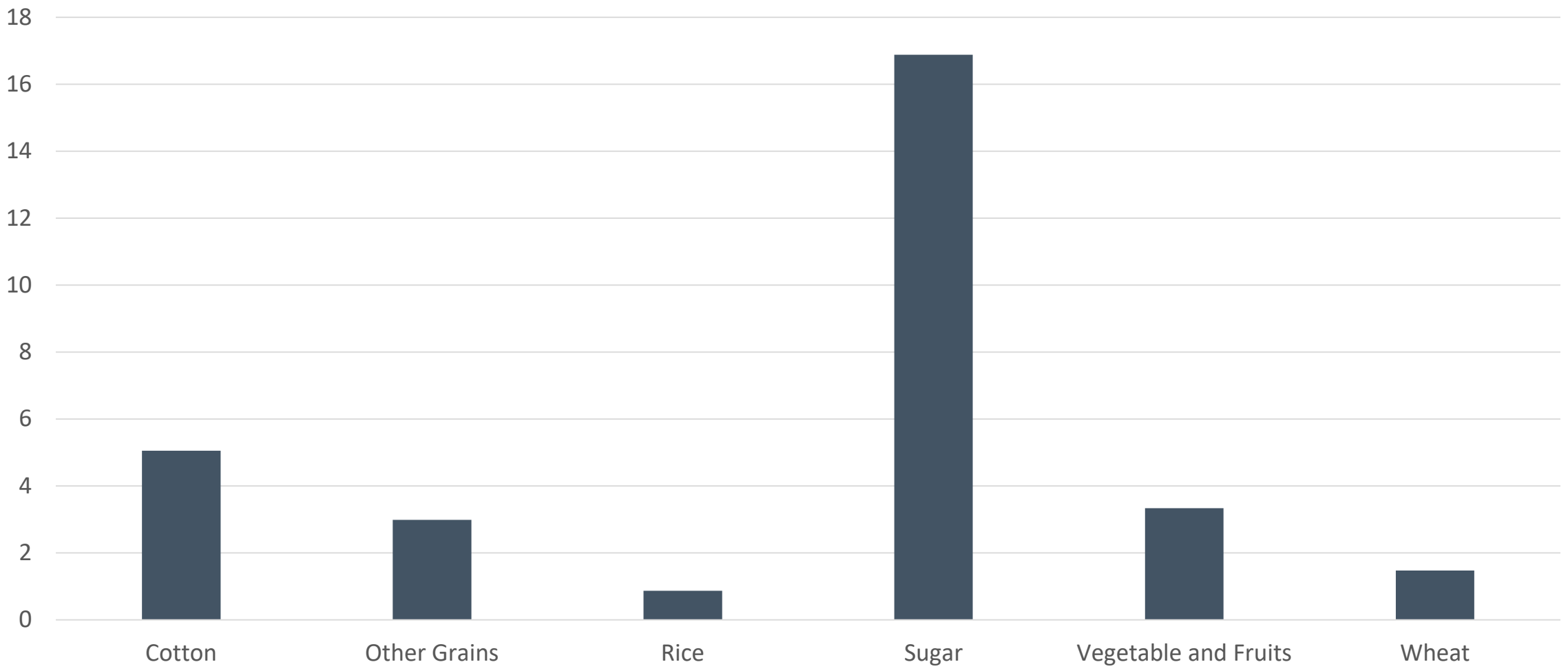
Heterogeneous projections
Illustration Rice- Irrigated



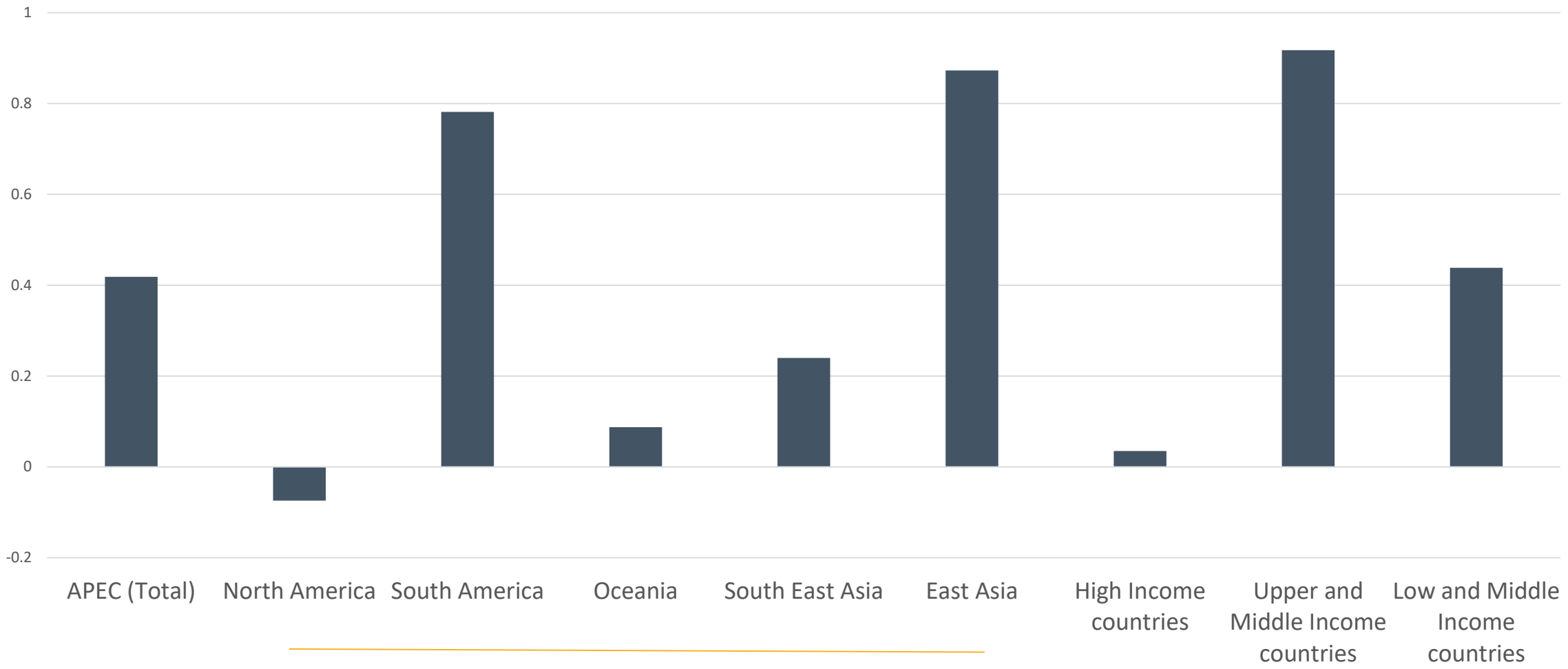
Average Yield impacts for APEC Economies by 2050



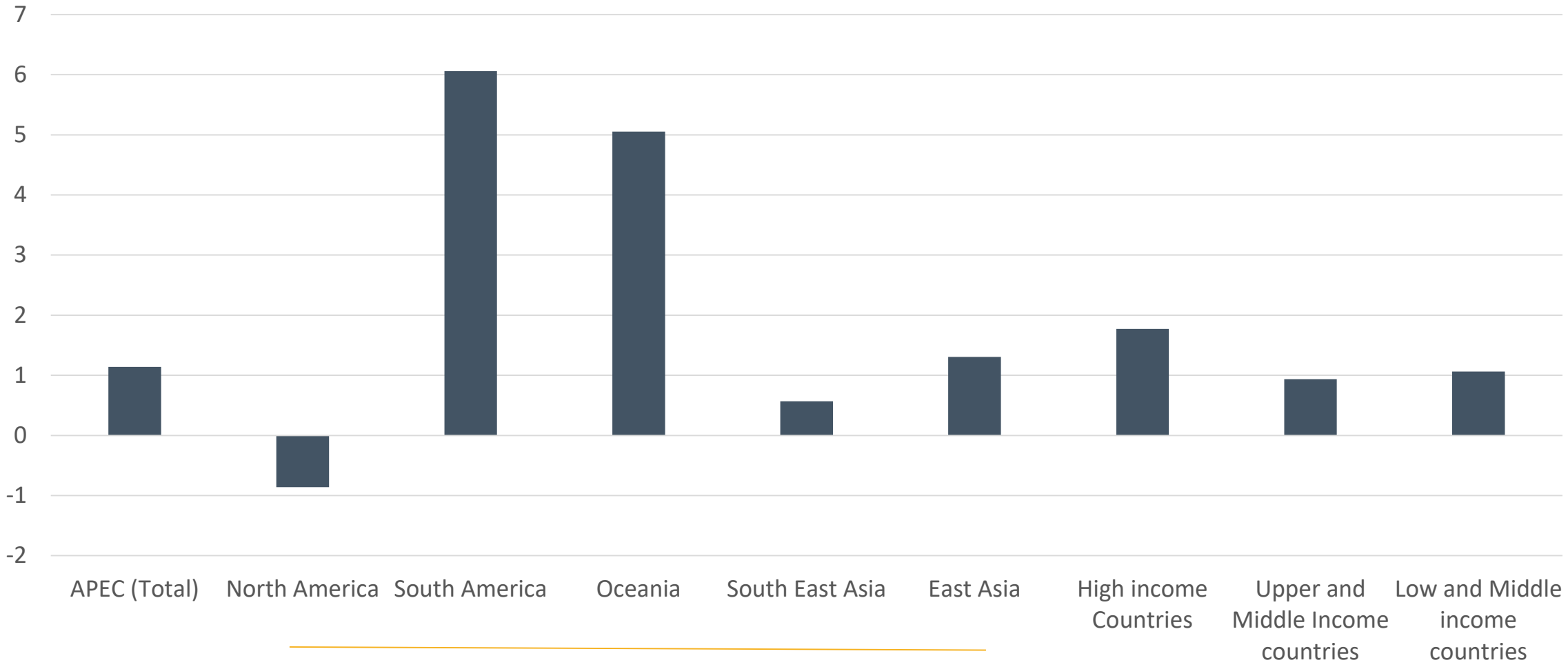
World Price increases due to climate change (average scenario)



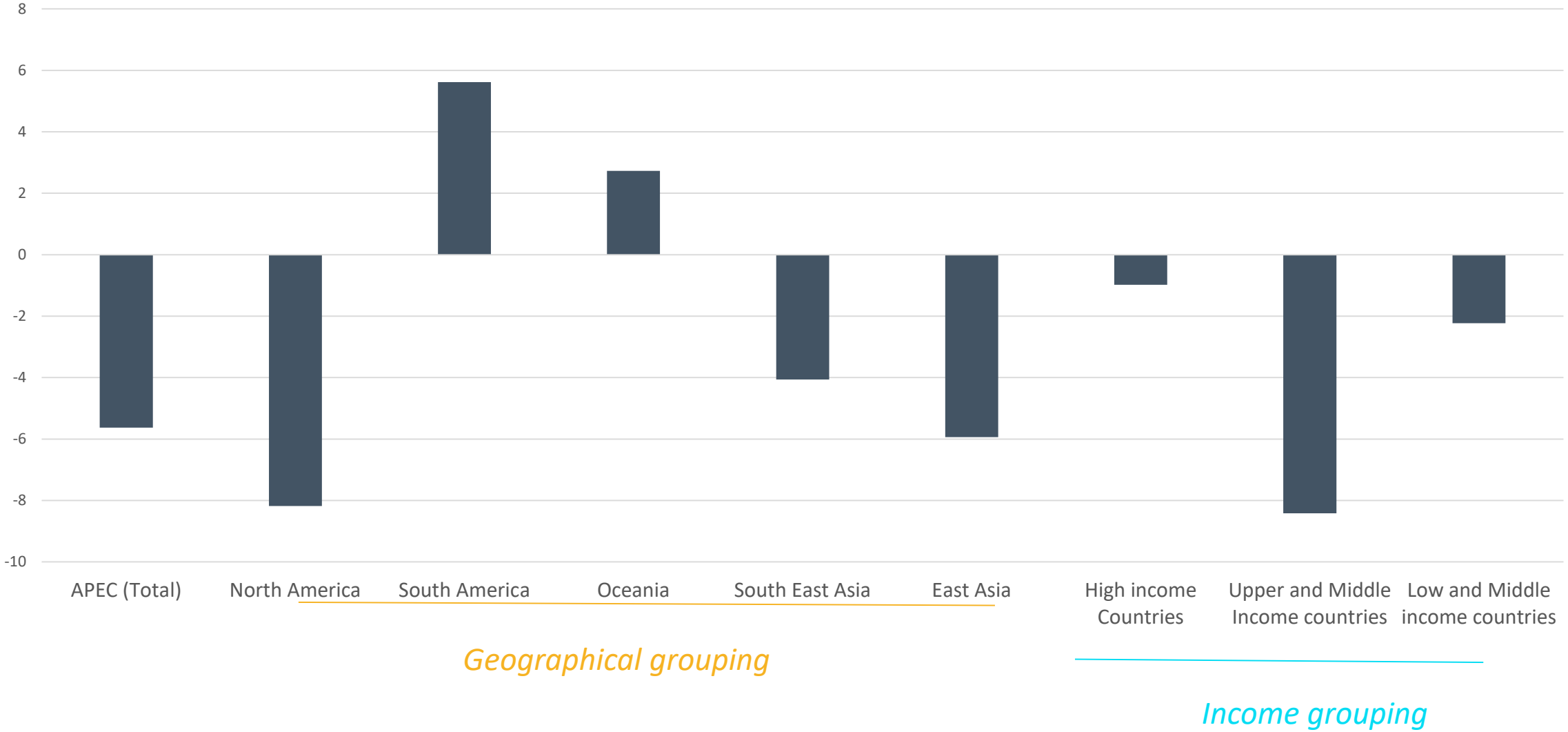
Average Impact of climate change (yield effects) on real income per capita, %, by 2050



Average Impact of climate change (yield effects) on Agricultural Value Added, %, by 2050

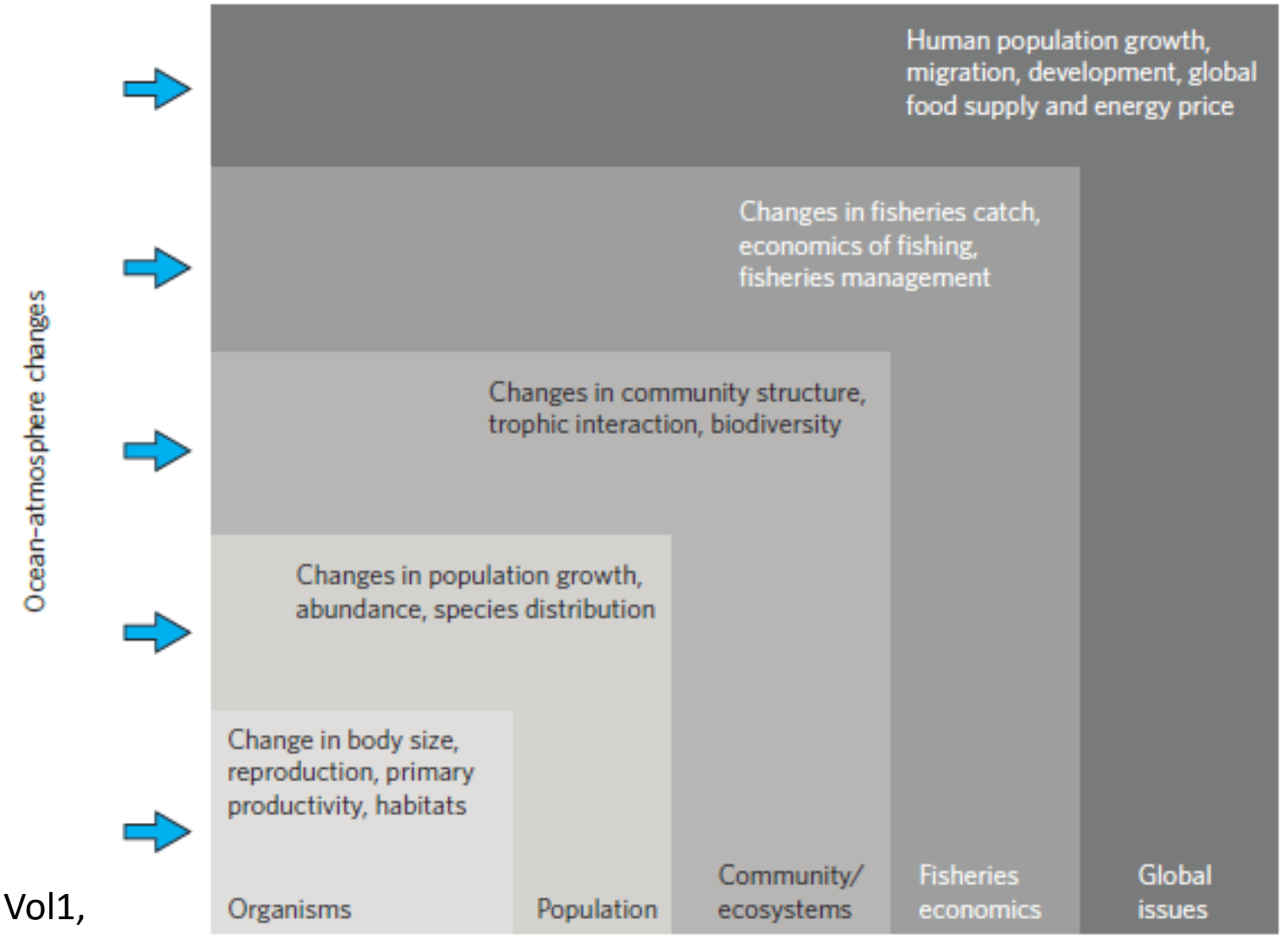


Average Impact of climate change (yield effects) on fruits and vegetables consumption per capita, %, by 2050



Effects over Fisheries

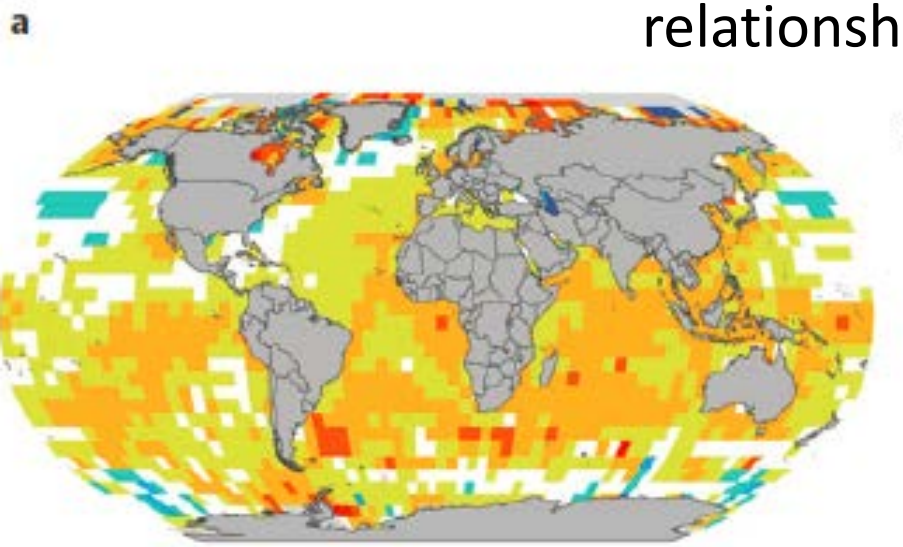
Schematic diagram indicating the biophysical and socio-economic impacts of climate change at different levels of organizations, from individual organisms to the society.

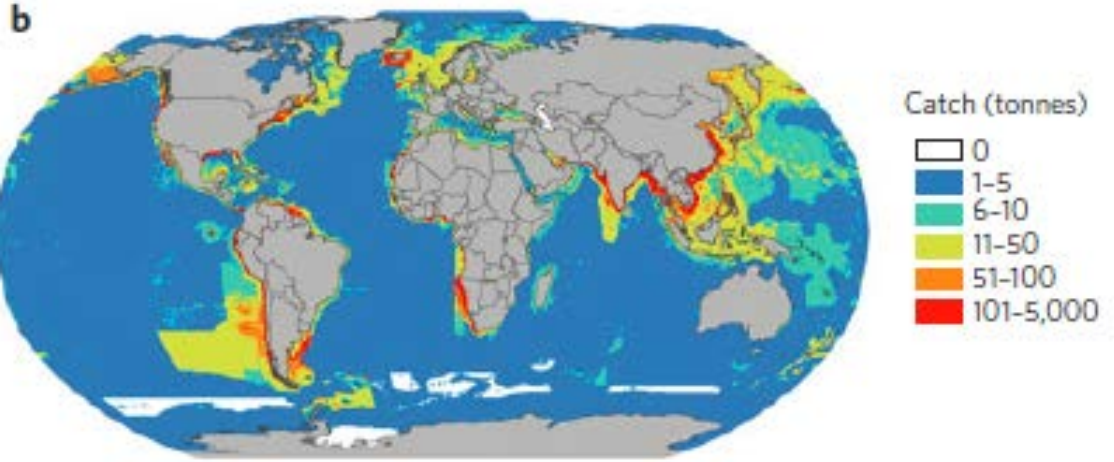


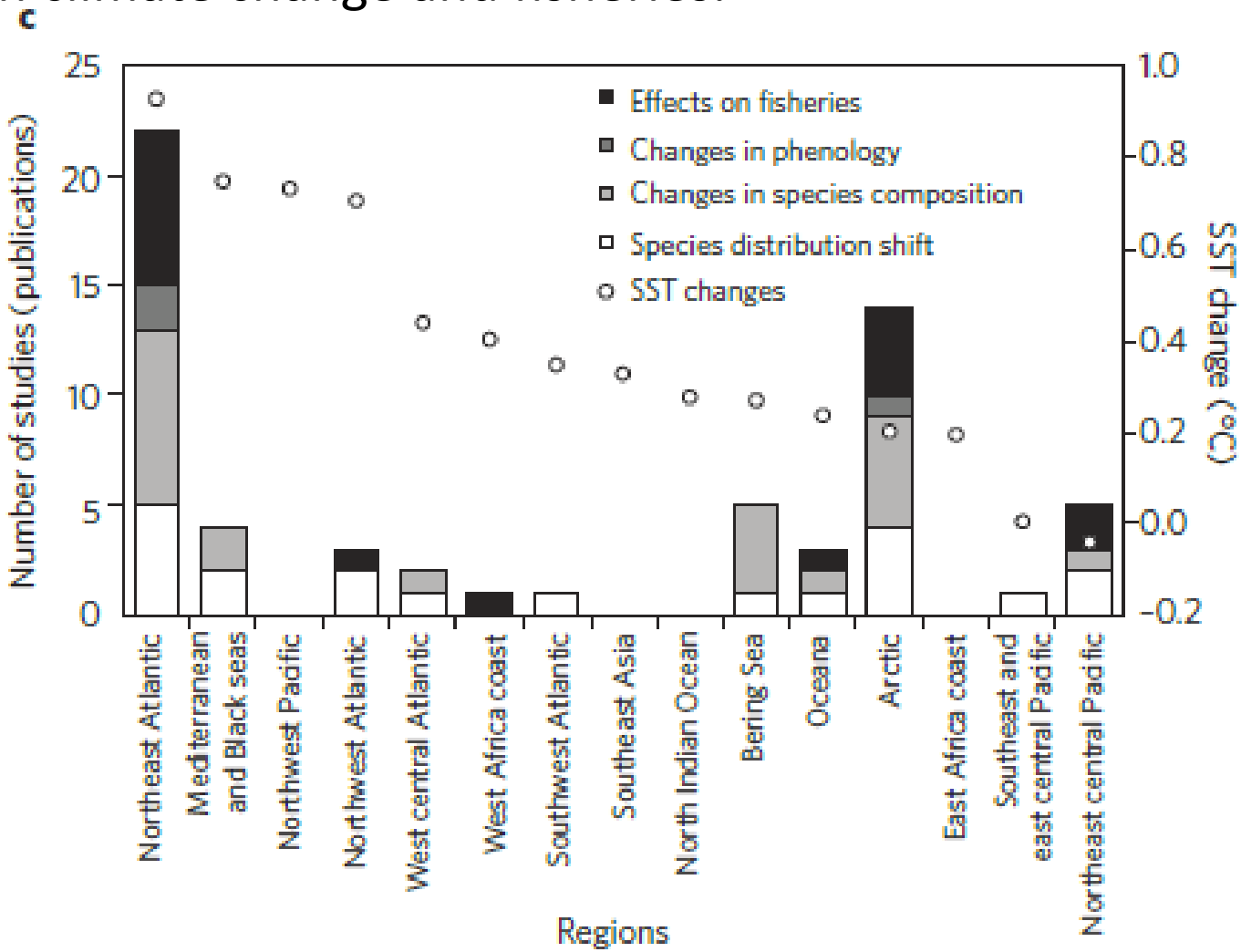
Source: U. Rashid Sumaila, et.al. Nature, Vol1, Dec 2011.

Effects over Fisheries

Sea surface temperature changes, global fish catch and the number of publications on the relationship between climate change and fisheries.







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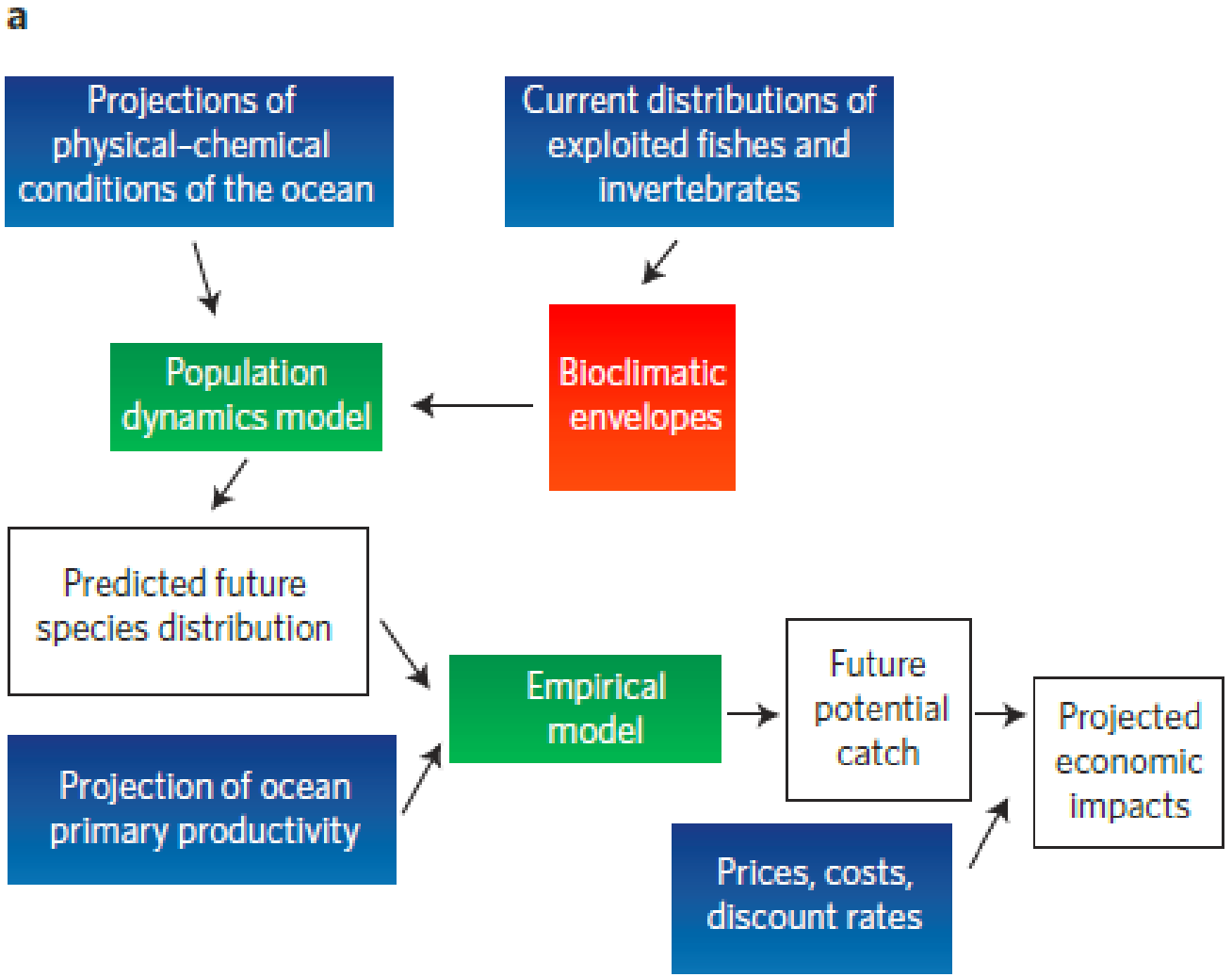
Effects over Fisheries

Summary of the approach and key results of a modelling study that assesses the impacts of climate change on potential catches from global fisheries



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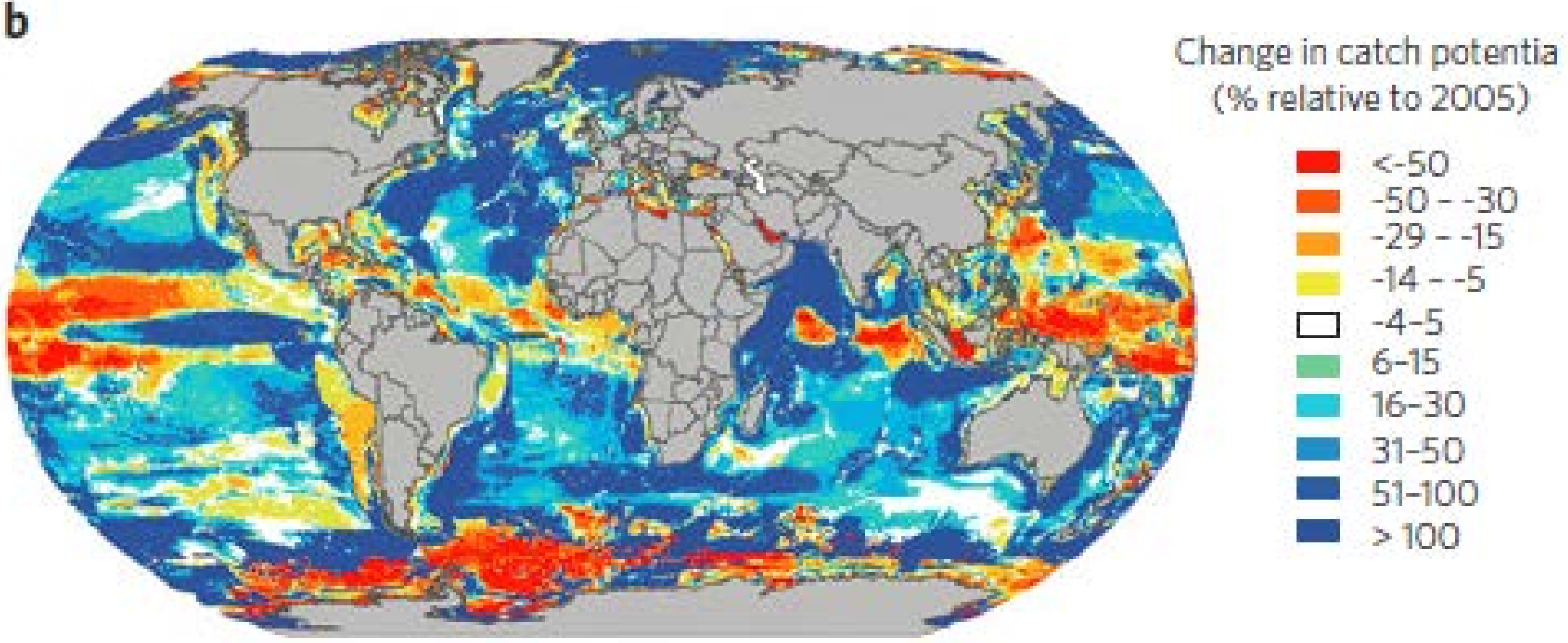

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Effects over Fisheries

Summary of potential impacts of climate change on the economics of fisheries based on information from the published literature

Impacts	Region	Catch	Prices	Cost	Earnings to companies	Resource rent
Shift in distribution of species	Arctic	Catch potential: increase[12] Invasion of warmer water species[47]	Decrease*	Fishing: decrease Adaptation: increase	Not yet known†	Increase[69,‡]
	Temperate	Catch potential: no change[12] Changes in species composition resulting from both species gains and losses[47]	Not yet known	Fishing: not yet known Adaptation: increase	Not yet known†	Increase[13,‡]
	Tropics	Catch potential: decrease[12] Species losses[47]	Not yet known	Fishing: increase Adaptation: increase	Not yet known†	No change
Ocean acidification	Global	Catch potential: decrease[32]	Increase[6]	Fishing: increase Adaptation: increase	Not yet known†	Increase[13]
Expansion of oxygen minimum zones	Global	Catch potential: decrease[32]	Increase	Fishing: increase Adaptation: increase	Not yet known†	Increase
Reduction in body size	Global	No change	Increase[72]	Fishing: no change Adaptation: increase	Not yet known†	Not yet known/ increase
Increased variability	Global	No change	Variable	Fishing: increase Adaptation: increase	Not yet known†	Not yet known/ increase
Increased extreme weather	Global	Actual catch: decrease	Increase*	Fishing: increase Adaptation: increase	Not yet known†	Not yet known/ increase

Details of each topic, and the supporting references, are summarized in this review. *Everything being equal, an increase in catch means a decrease in price, but recall discussion in main text. †Depends on the interplay between changes in price and the cost of fishing and adaptation. ‡In general, whether rent will increase or decrease depends on the state of the resources before climate change, and the institutional and management regimes in place. *Everything being equal, if catch decreases then price increases, but recall discussion in main text.

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Climate Smart Policies:
We Know the Big Picture

CLIMATE SMART POLICIES
WE KNOW THE BIG PICTURE

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1. Accelerate investments in agricultural R&D for productivity growth and climate resilience
2. Increase investment in rural infrastructure; regulatory reform in seed and input markets; improve extension services (big data, IT)
3. Reform economic policies: open trade; land and water rights; reduction of energy, water, and fertilizer subsidies; value carbon

Climate Smart Policies:
But the Details Need More Evidence

CLIMATE SMART POLICIES: BUT THE DETAILS NEED MORE EVIDENCE

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1. Analysis is needed to close knowledge or information gaps regarding the degree of "climate smartness" of policies, investments and technologies.

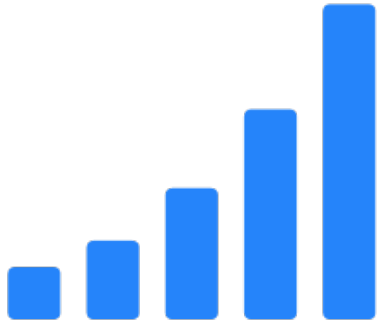
2. Market signals cannot provide the necessary guidance because impacts are not easily observable and prices are missing on resilience and GHG emissions. So these need to be discovered through analysis.

3. In addition, climate smartness is highly location specific, so evidence needs to be spatially disaggregated.

CONCLUDING REMARKS

CSA forces us to shifts the emphasis from policies that aim at a single targets to policies that have multiple objectives.

CSA changes the planning time horizon: policies and analyses necessarily span long time periods of 20-30 years.



CONCLUDING REMARKS

Therefore, CSA requires the use of integrated modeling frameworks that work at multiple geographical scales to:

1) Prioritize investments and provide an accurate understanding of tradeoffs
2) Increase velocity of technological innovation and adoption taking into account demand side
3) Design long-term economically and politically sustainable policies

CONCLUDING REMARKS

More importantly, given its complexity, CSA requires an even closer collaboration between policy makers and research community.