



Adaptating agriculture to climate variability and extreme events

Julian Ramirez-Villegas

School of Earth and Environment, University of Leeds

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)



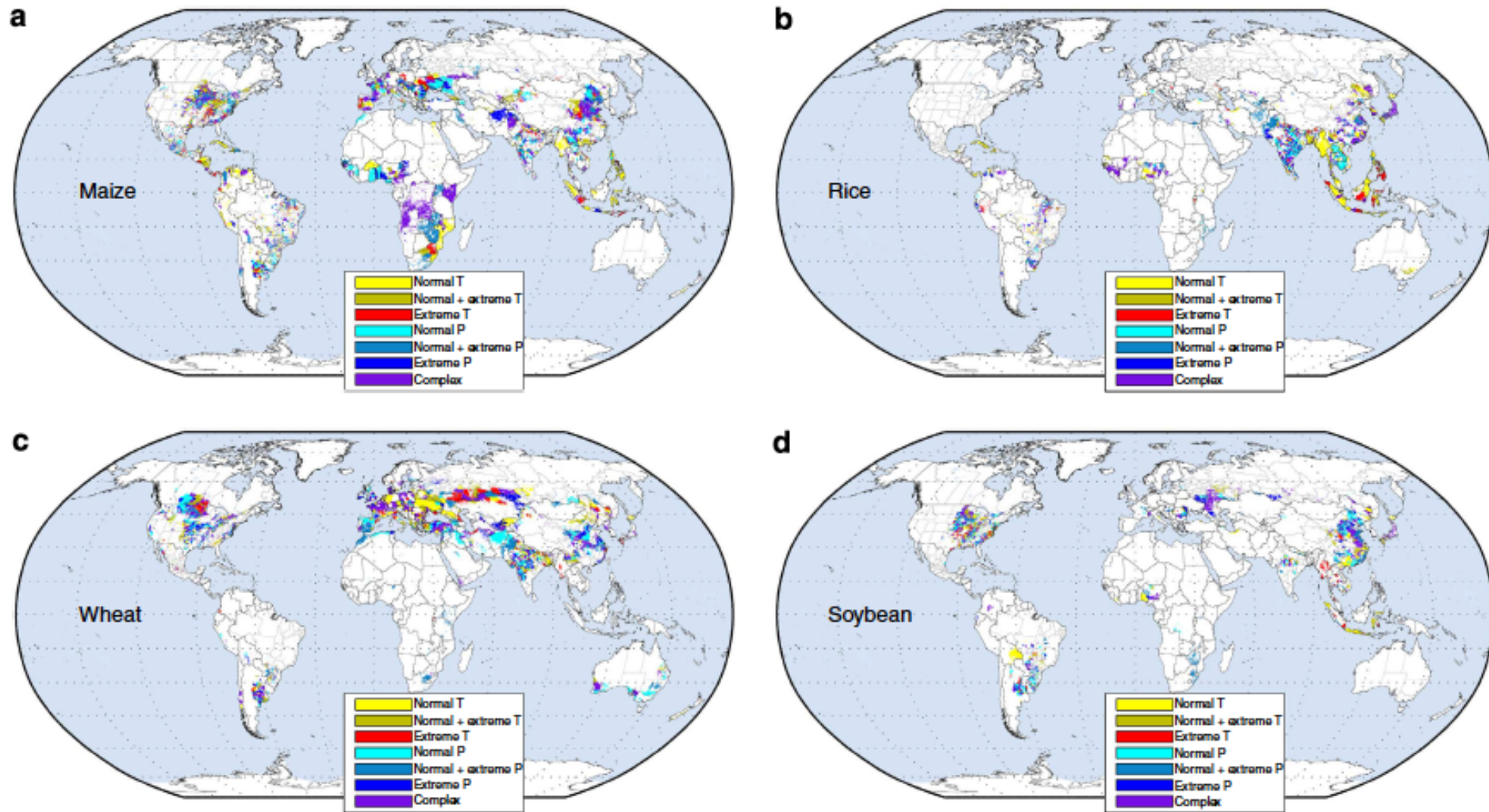
RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



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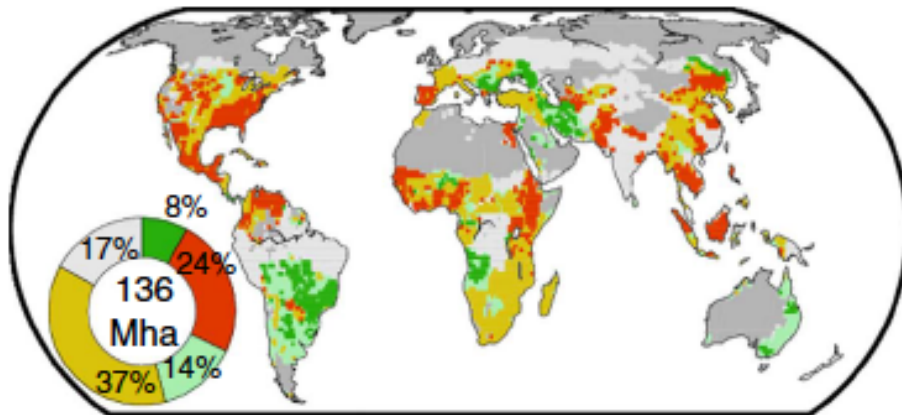
The importance of local climate variability



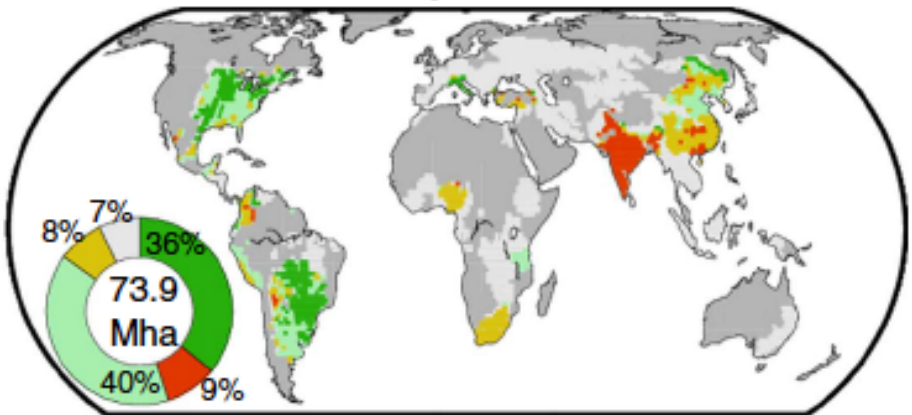
... of major modes of variability

El Niño minus neutral

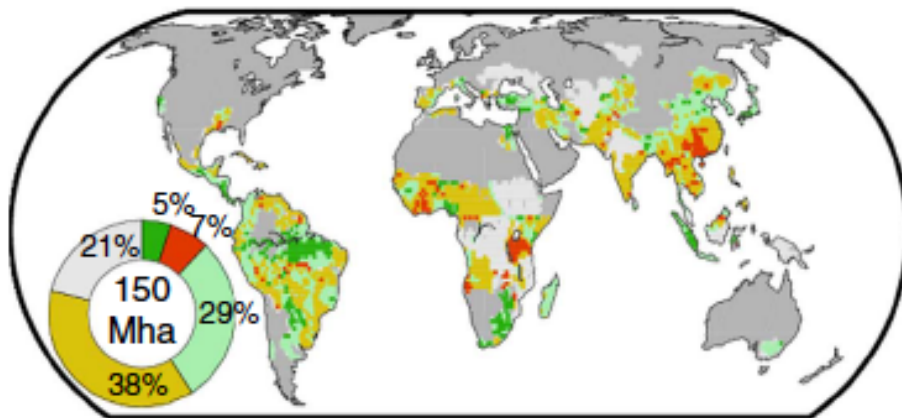
Maize



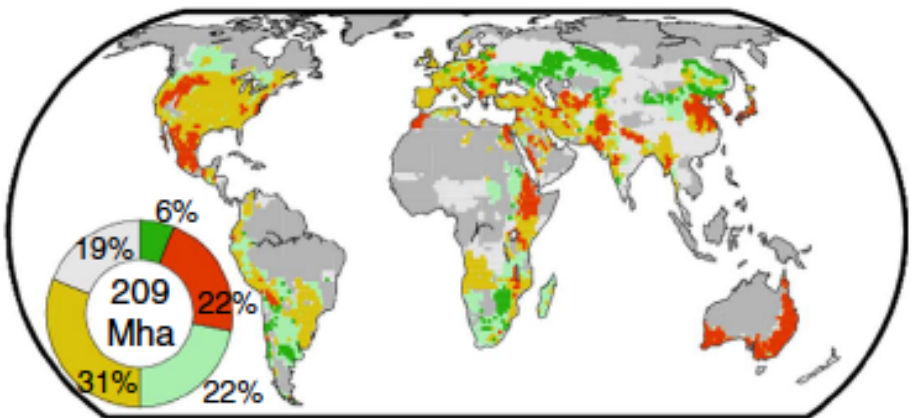
Soybean



Rice



Wheat

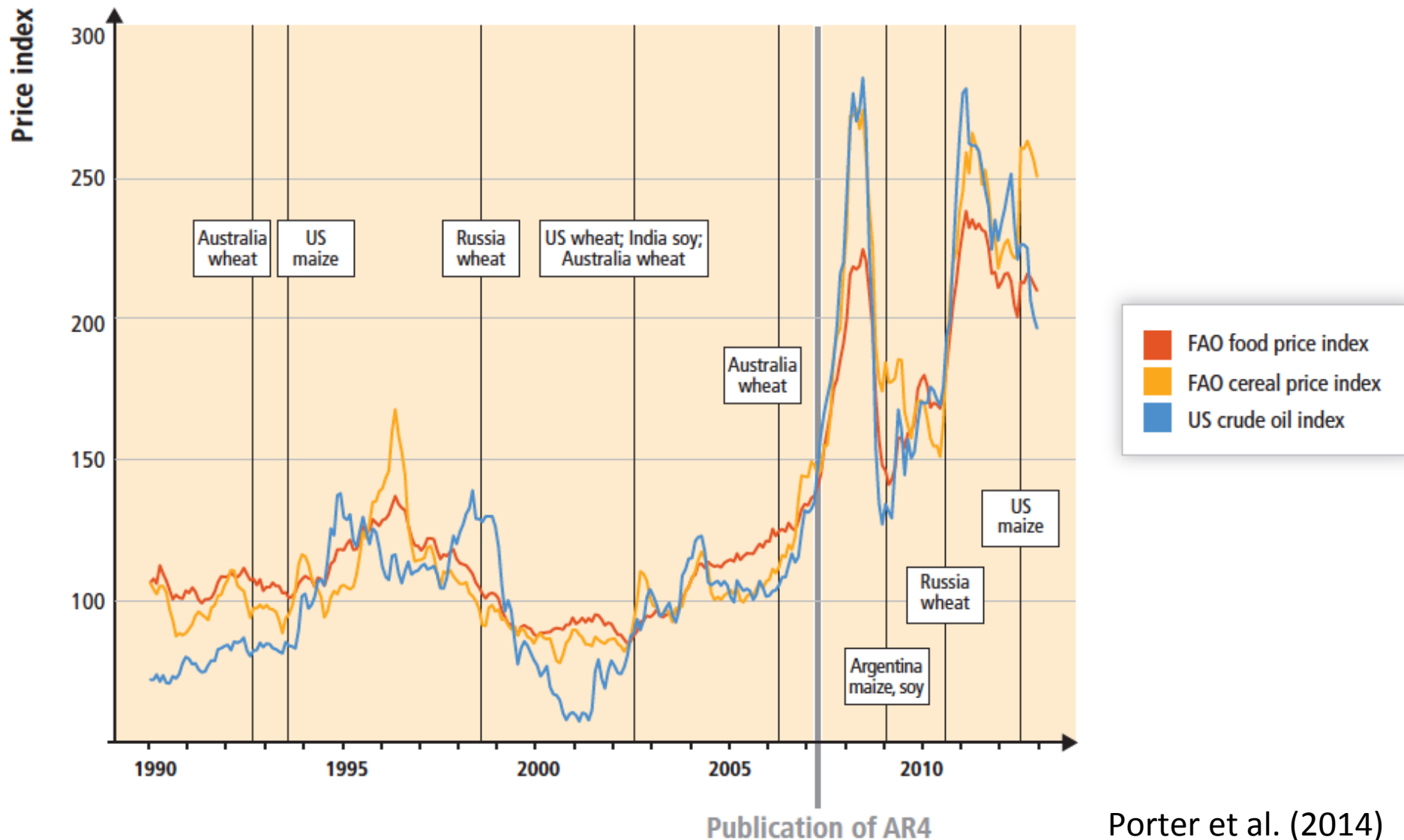


■ Significant-positive impacts
■ Insignificant-positive impacts

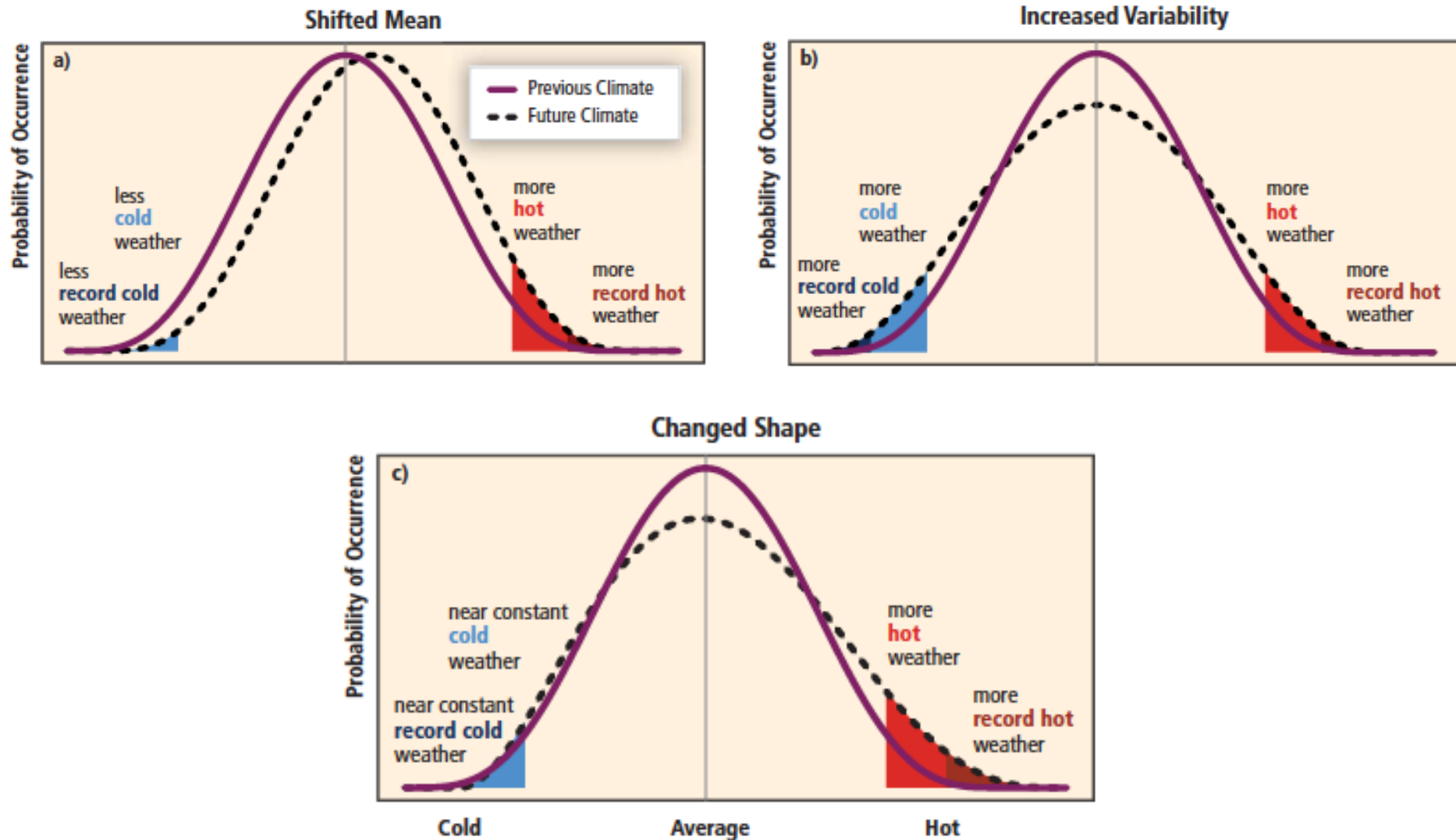
■ Significant-negative impacts
■ Insignificant-negative impacts

■ No yield data are available
■ Non-cropland

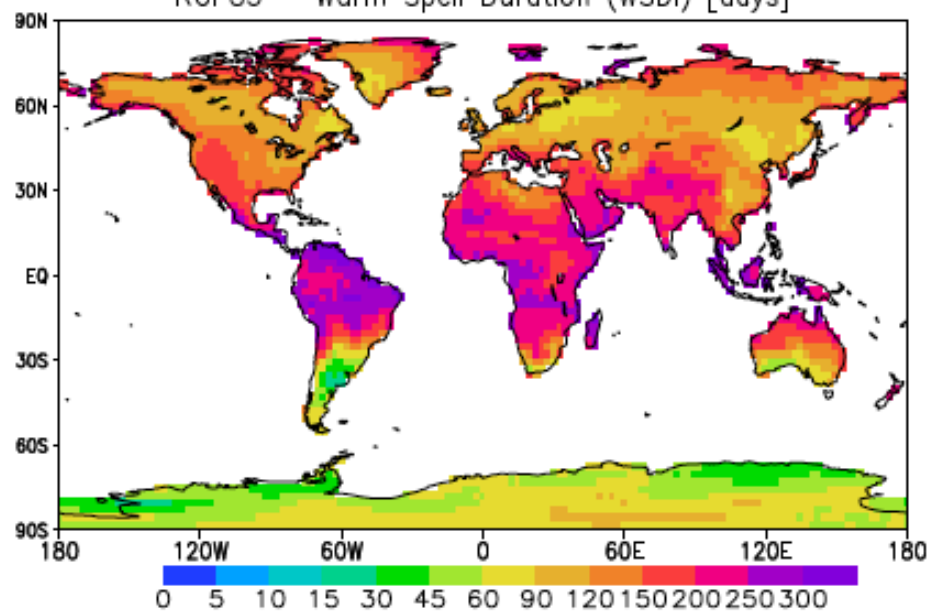
...And of extremes



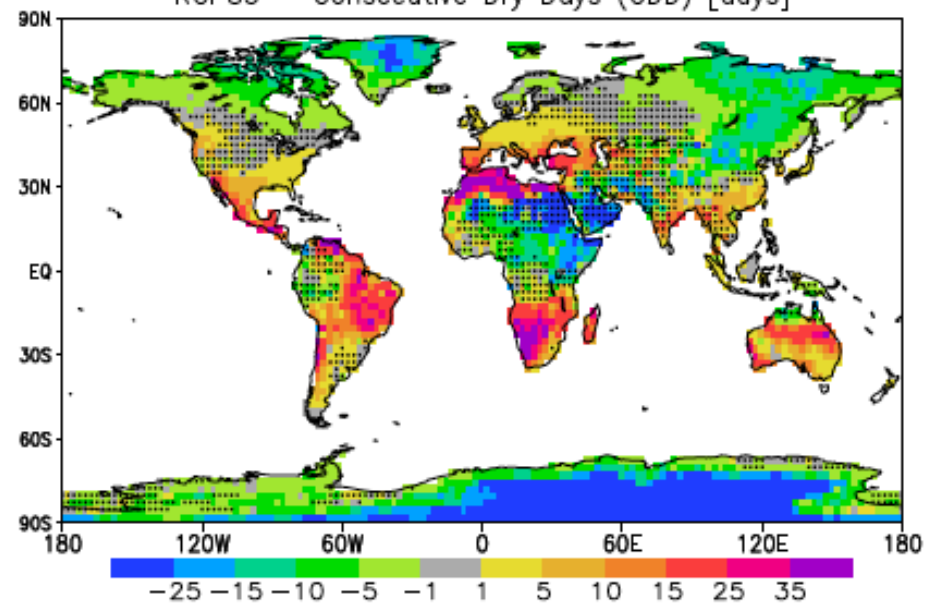
Types of changes climate and implications for extremes



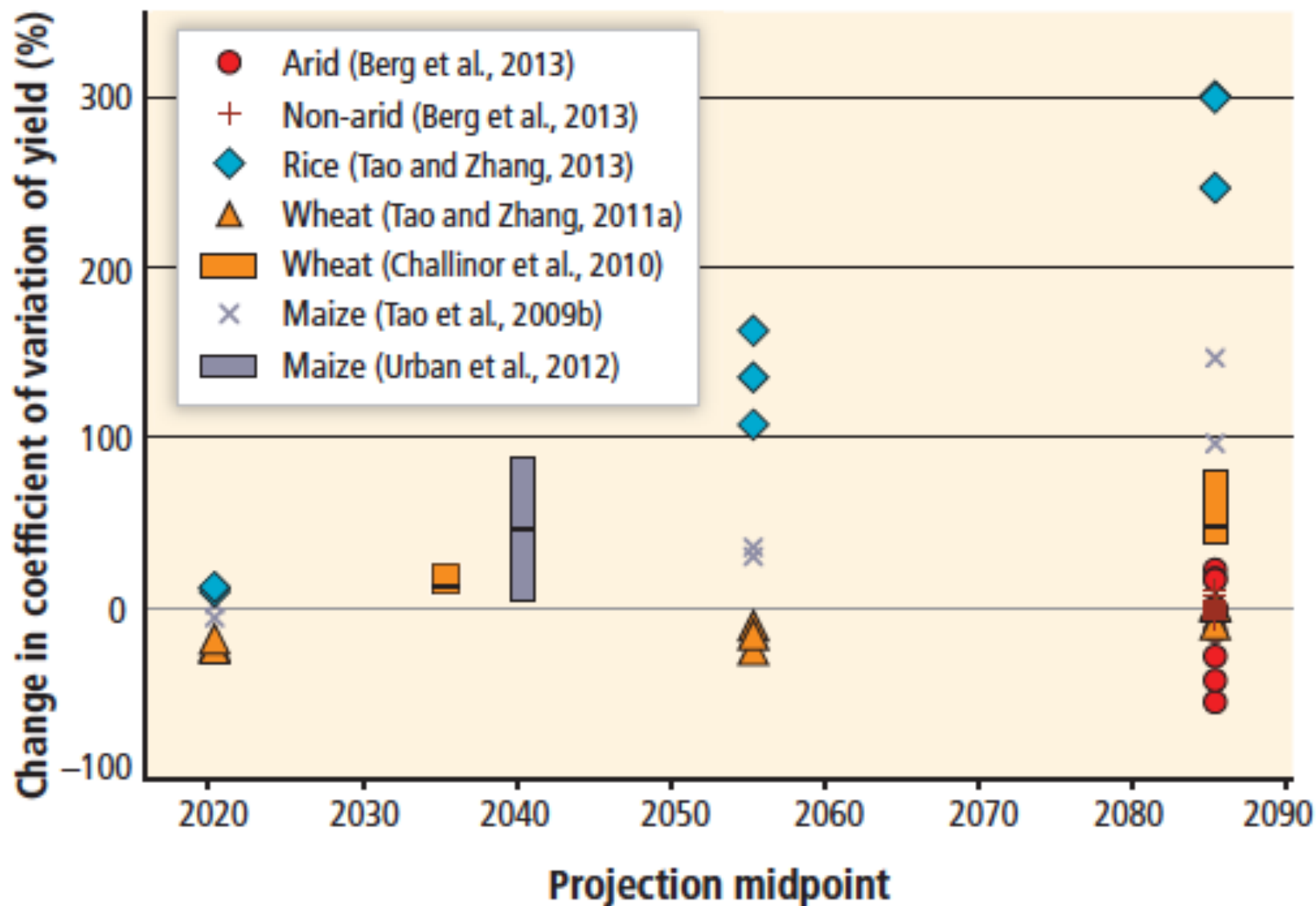
RCP85 – Warm Spell Duration (WSDI) [days]



RCP85 – Consecutive Dry Days (CDD) [days]

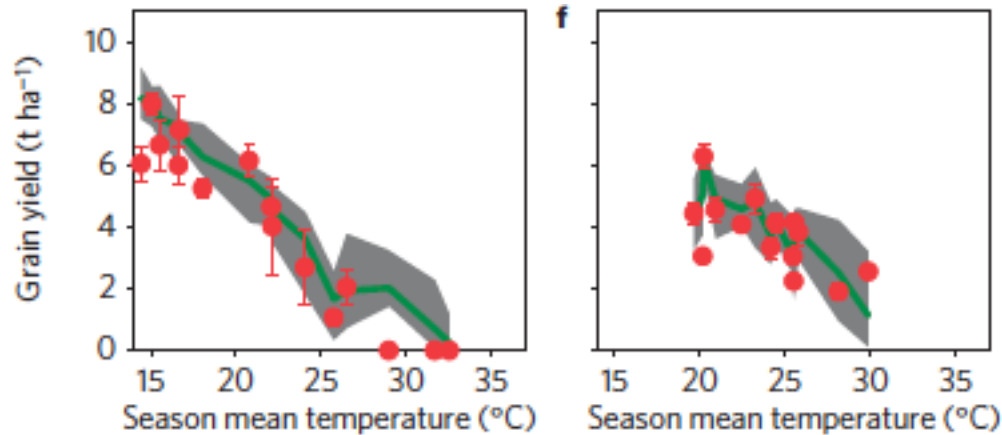


Sillmann et al. (2013) JGR

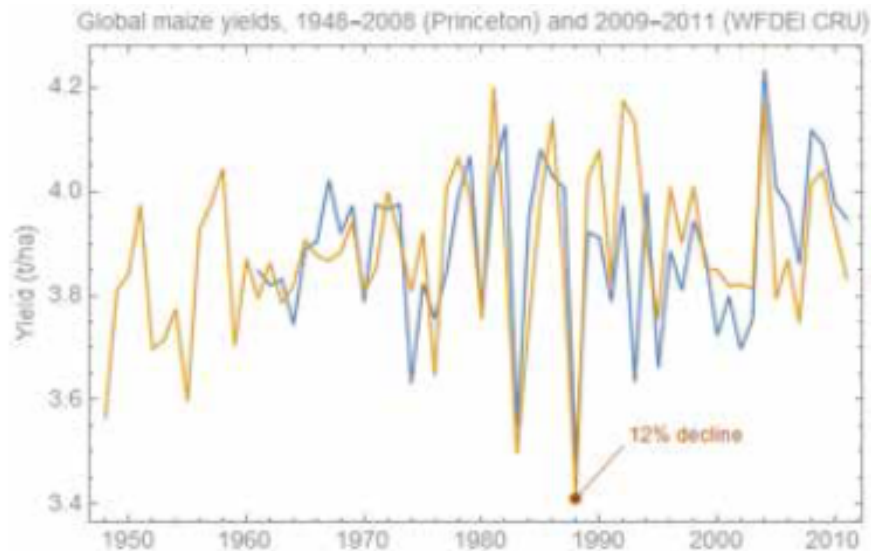


Extremes across temporal scales

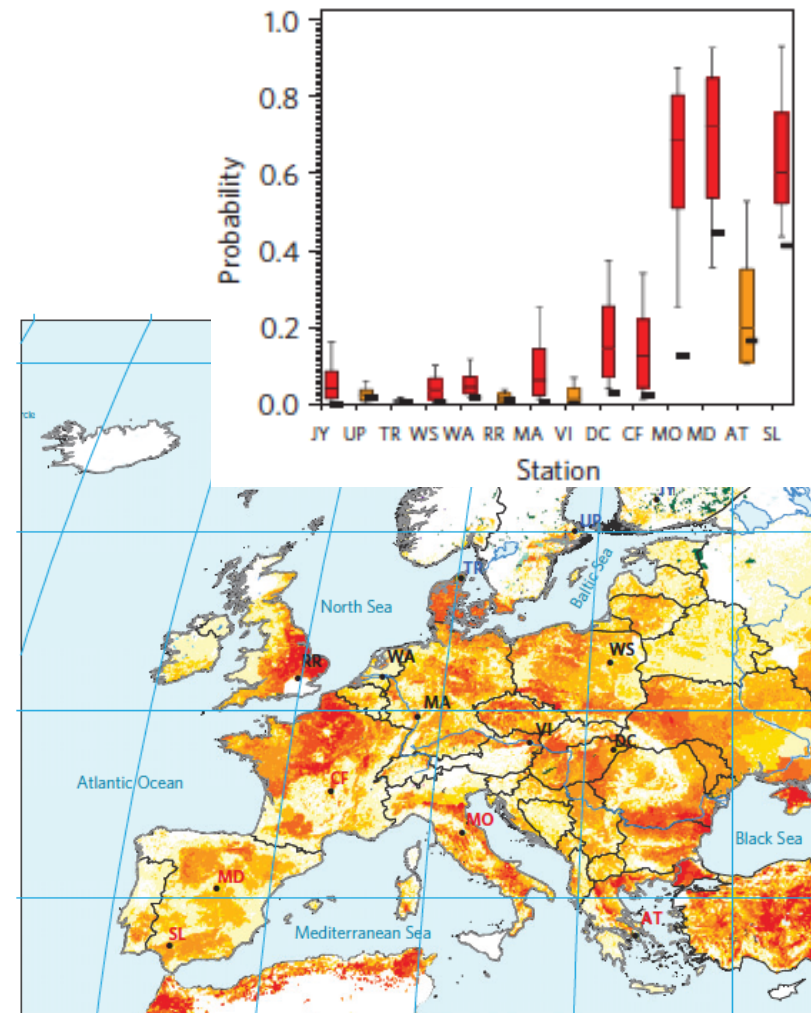
Sub-daily, daily, sub-seasonal, seasonal and yearly



Asseng et al. (2015) NCC



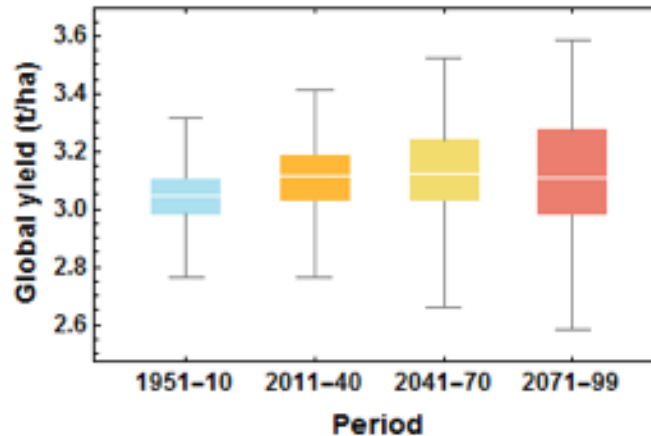
GFS Resilience Taskforce (2015)



Trnka et al. (2014) NCC

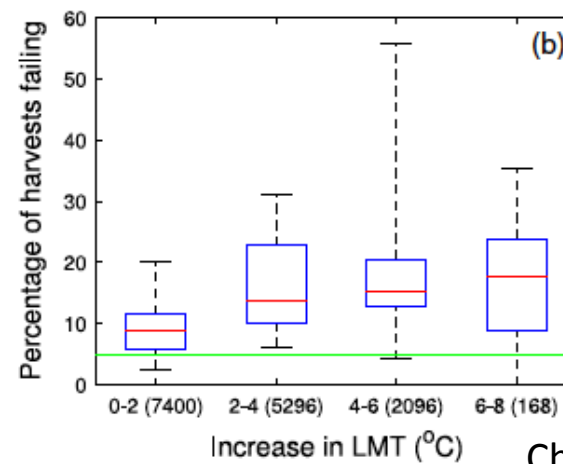
Extremes across spatial scales

- Global production shocks mediated by markets, with impacts on prices



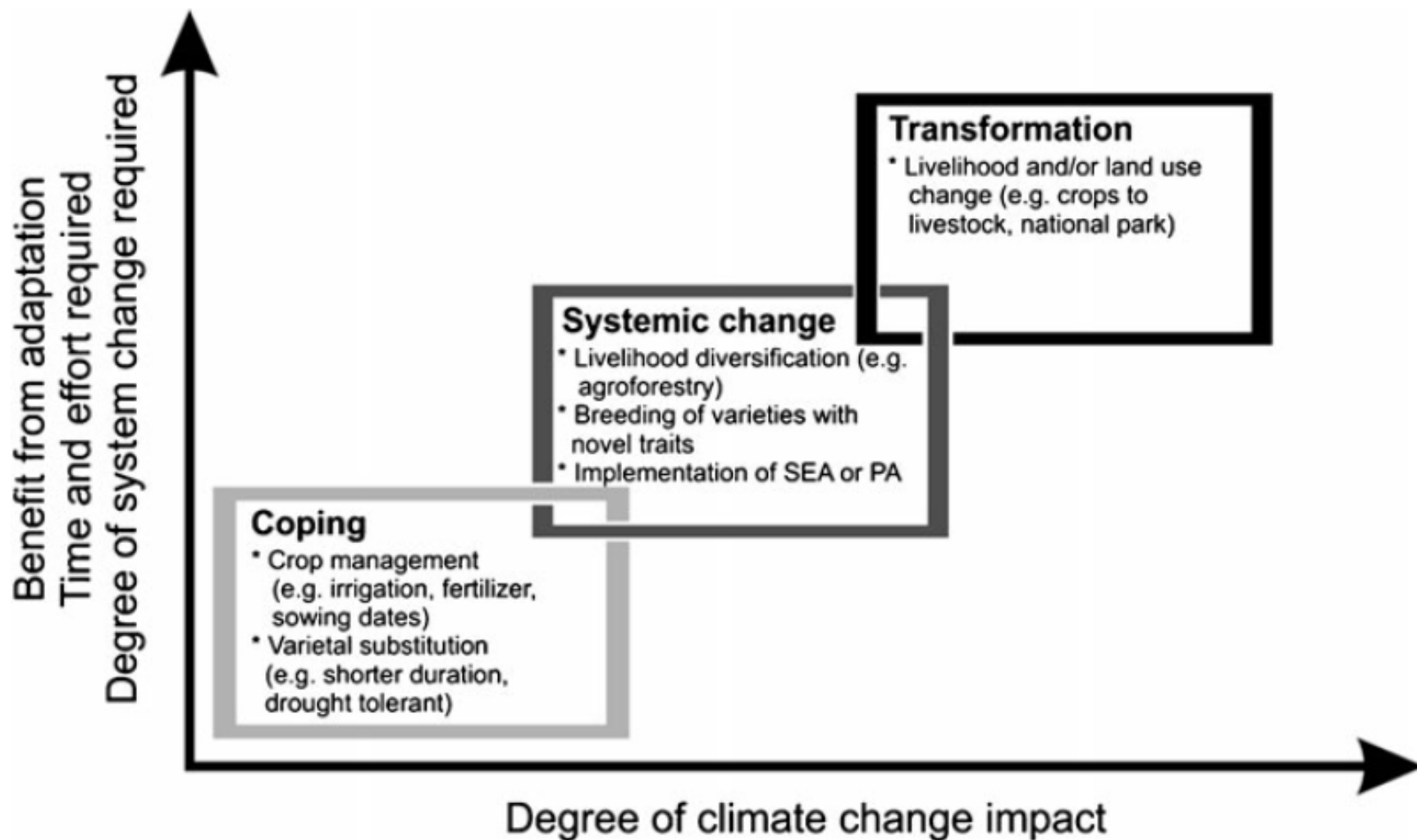
GFS Resilience Taskforce (2015)

- Local weather-driven productivity and planted / harvested area reductions



Challinor et al. (2010)

Adaptation across timescales



Adaptating to changes in variability and extremes

- At the local and regional scale --forecasting

Farmers want to:

Identify the most appropriate planting date **(with best environmental supply)** for rice crop in the period May - Dec 2014.

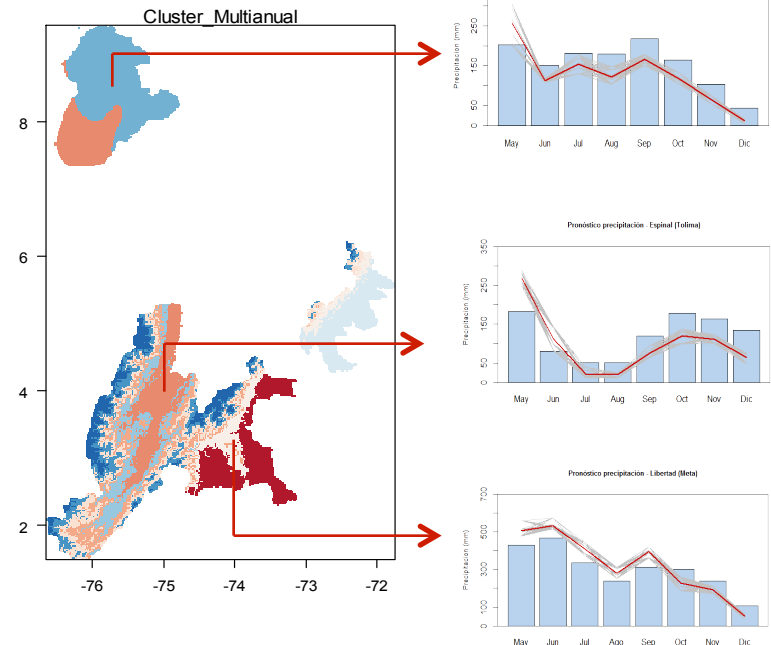
How?



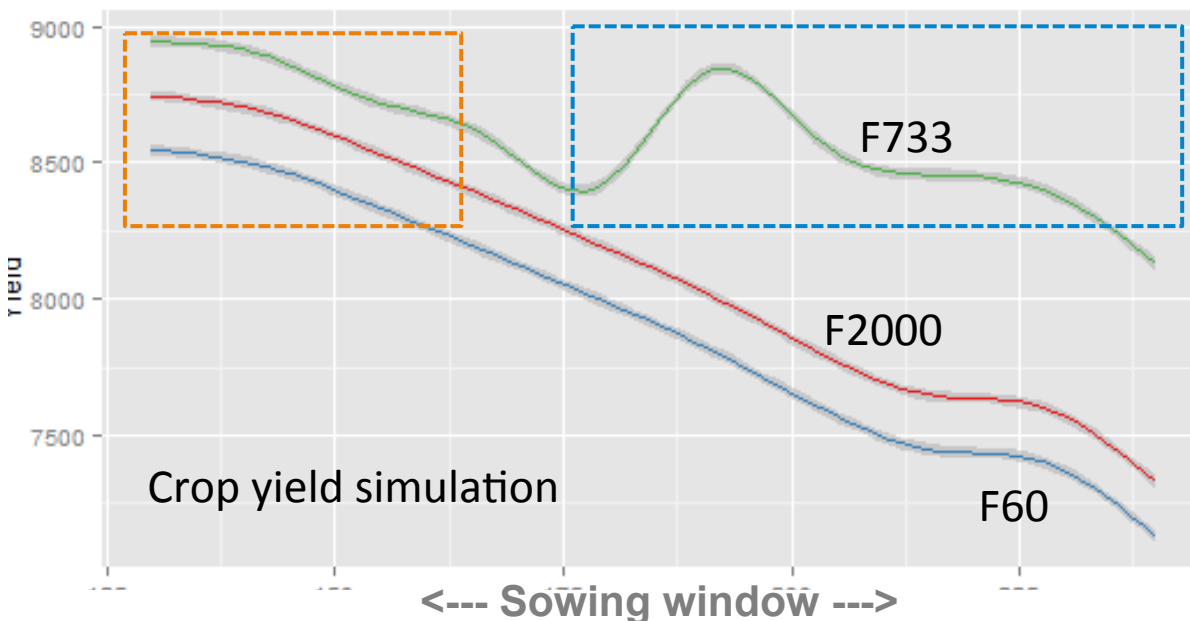
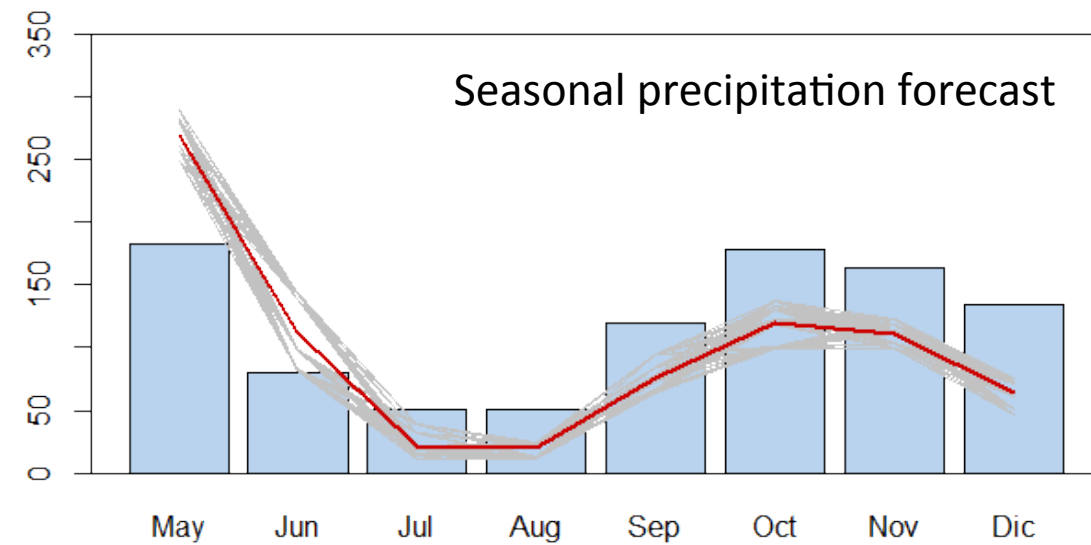
Implement seasonal weather forecasts + historical events of "El Niño" + mechanistic crop models

Where

Agro-climatic rice productive regions



Central Colombia (Magdalena valley)



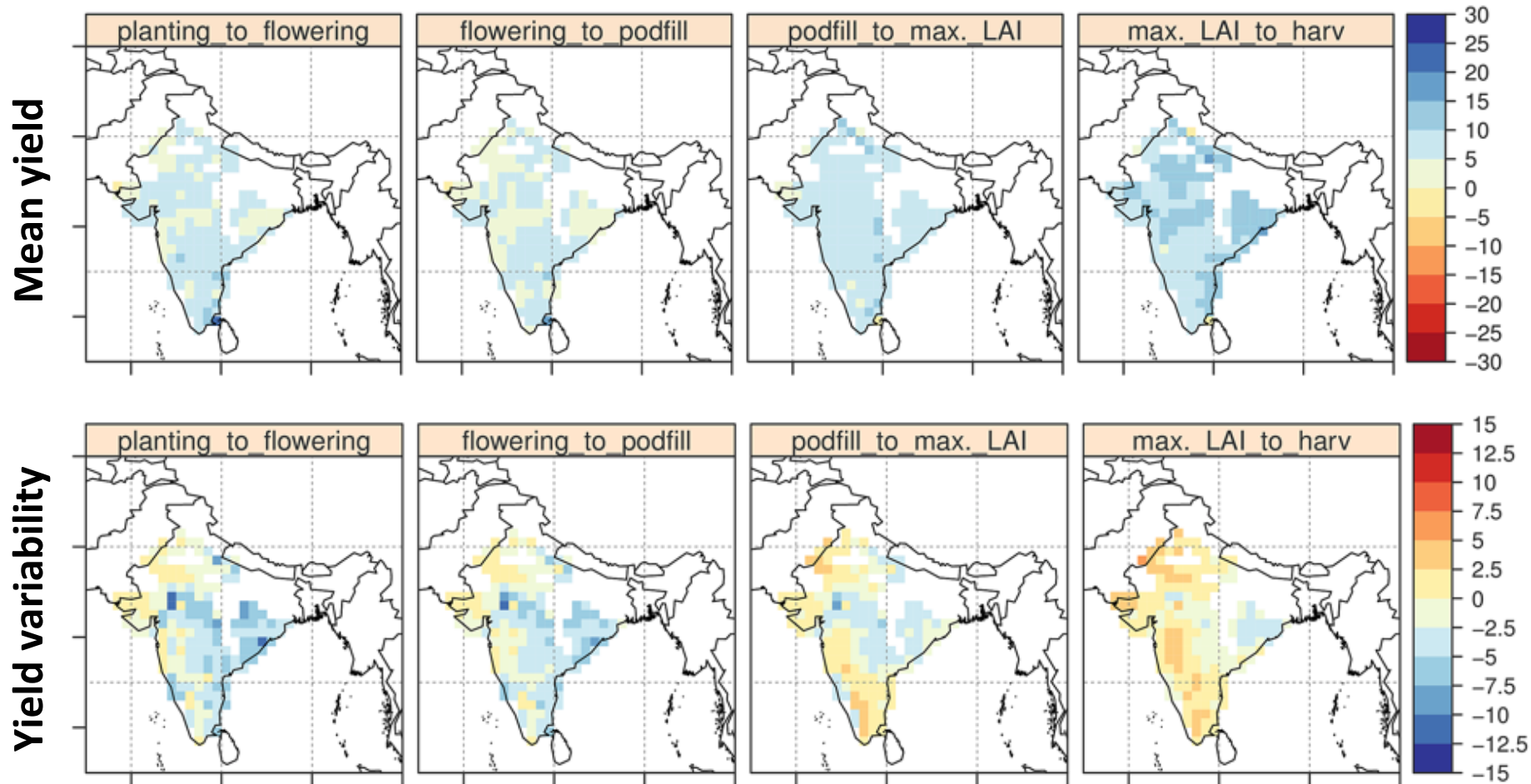
**Validating recommendations
in the field (2014)**

F733: 6860 kg/ha

F60: 4600 kg/ha

Adapting to changes in variability and extremes

- The role of genotypic adaptation



Adapting to global shocks and amplifications

- Less clear, but foremost, develop understanding of changes in extremes in production (both area and yield). Both global and regional-scale models have roles to play
- Agricultural adaptation. Again both models have roles to play (e.g. Land use vs. Agronomy).
- Enhance systemic resilience in global market system (control export controls, flexibilise biofuel mandates, market monitoring)
- National resilience: strategic storage, advance contracts, dietary or import diversification