



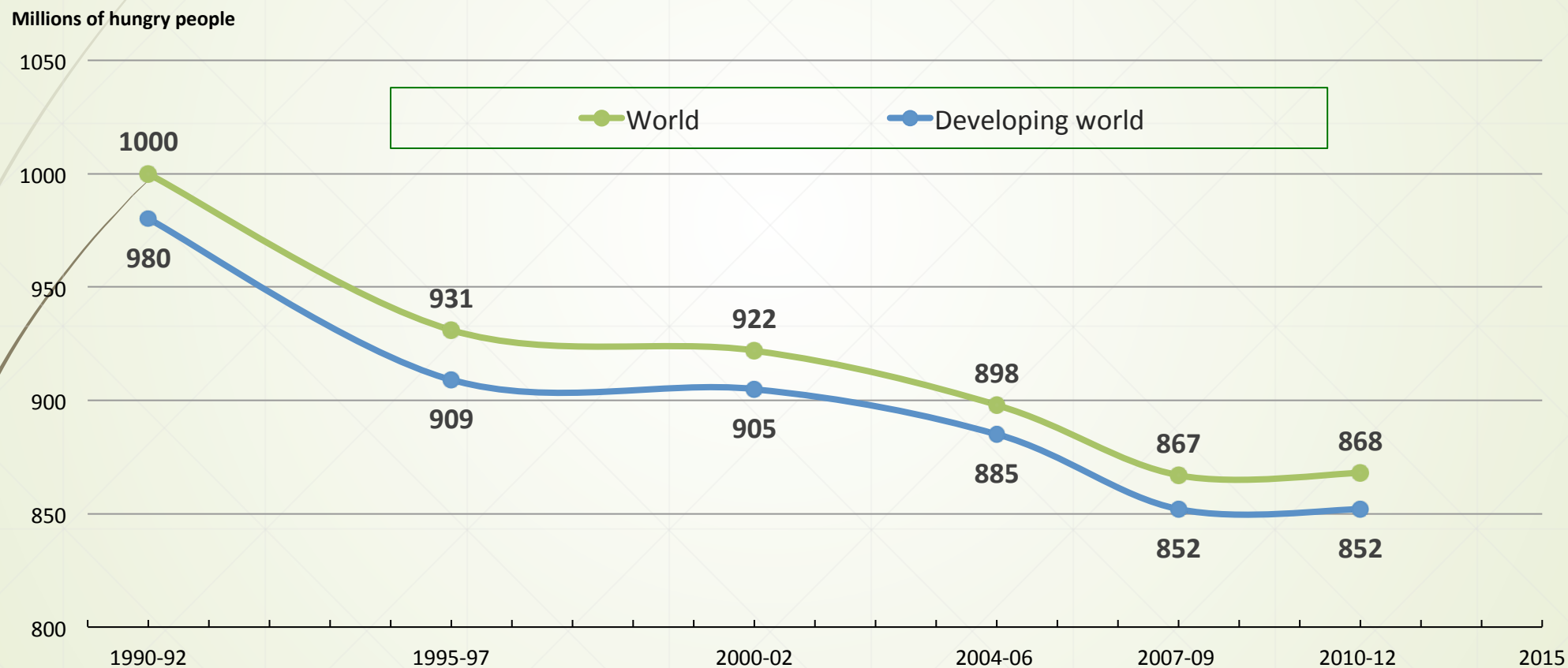
Confronting the Food Security Threats from Climate Change

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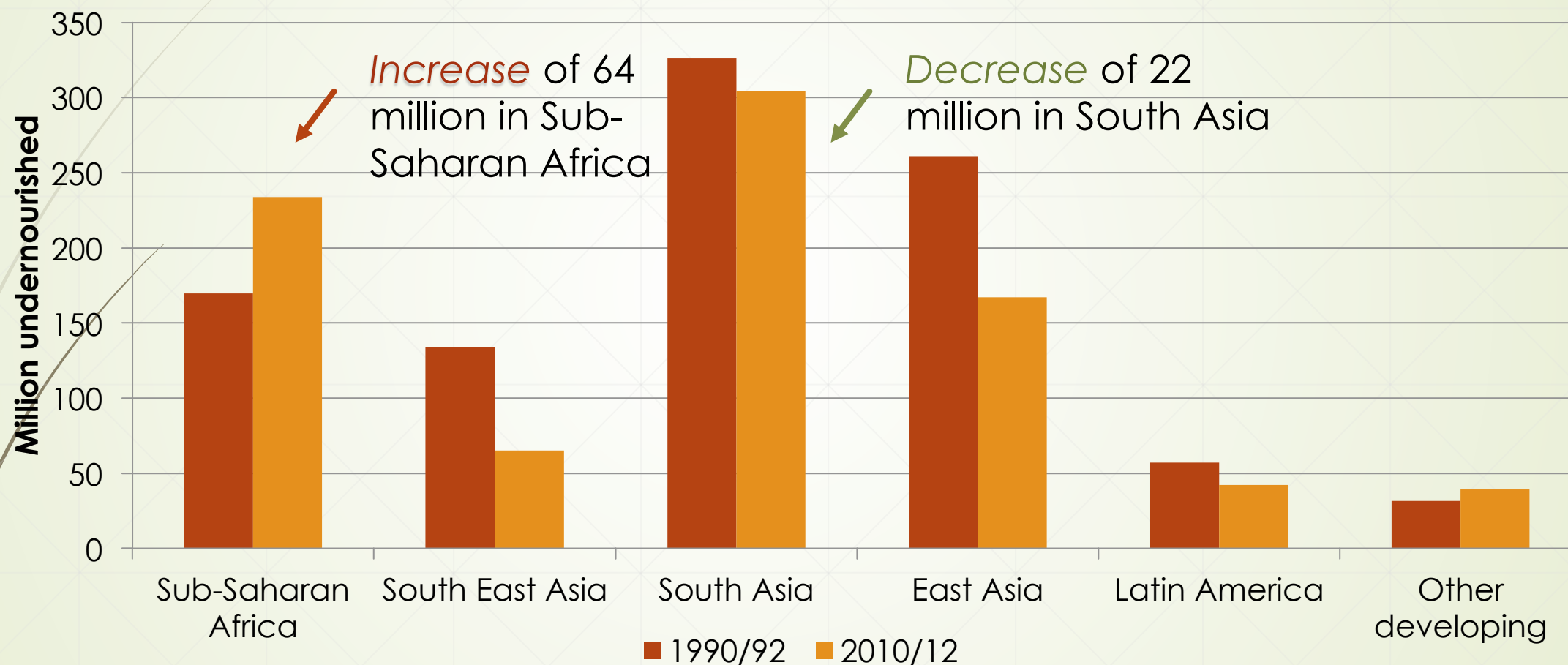
Professor Emeritus, University of Illinois, Urbana-Champaign

After a steady decline, progress towards the MDG hunger target has stalled



Source: Food and Agriculture Organization of the United Nations (2012).

Regional disparities in reducing undernourishment are large. Between 1990 and 2011,...



Source: Food and Agriculture Organization of the United Nations (2012).



What Might the Future Hold?



The sources of food security challenges: drivers of change

➤ Demand

- The number of people
- Their command over financial and physical resources
- Their dietary desires
- Their location

➤ Supply

- The capacity of natural resources, augmented by human actions, to meet these demands over an extended period
-



Food security challenges are unprecedented

➤ On the demand side

➤ More people

- 50 percent more people between 2000 and 2050

- Almost all in developing countries

➤ With more income

- More demand for high valued food (meat, fish, fruits, vegetables)

➤ On the supply side

- Unsustainable growth of natural resource use *today*

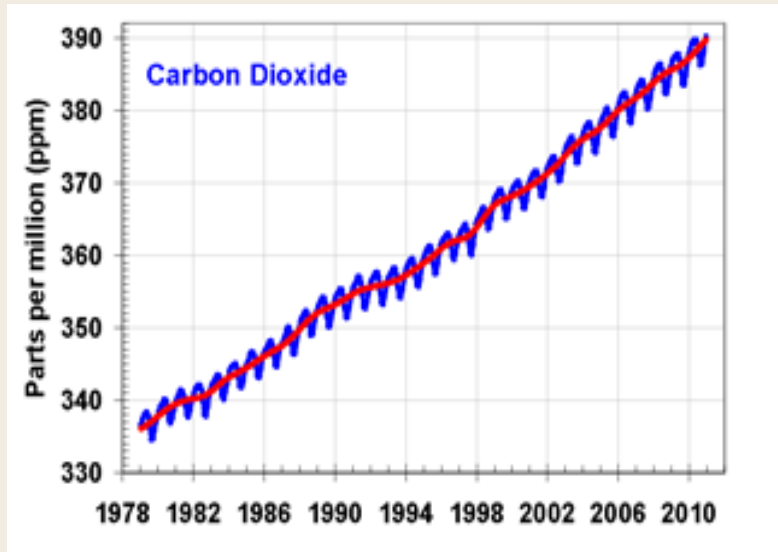
- Climate change effects become serious *tomorrow*

- Reduces productivity of existing varieties and cropping systems

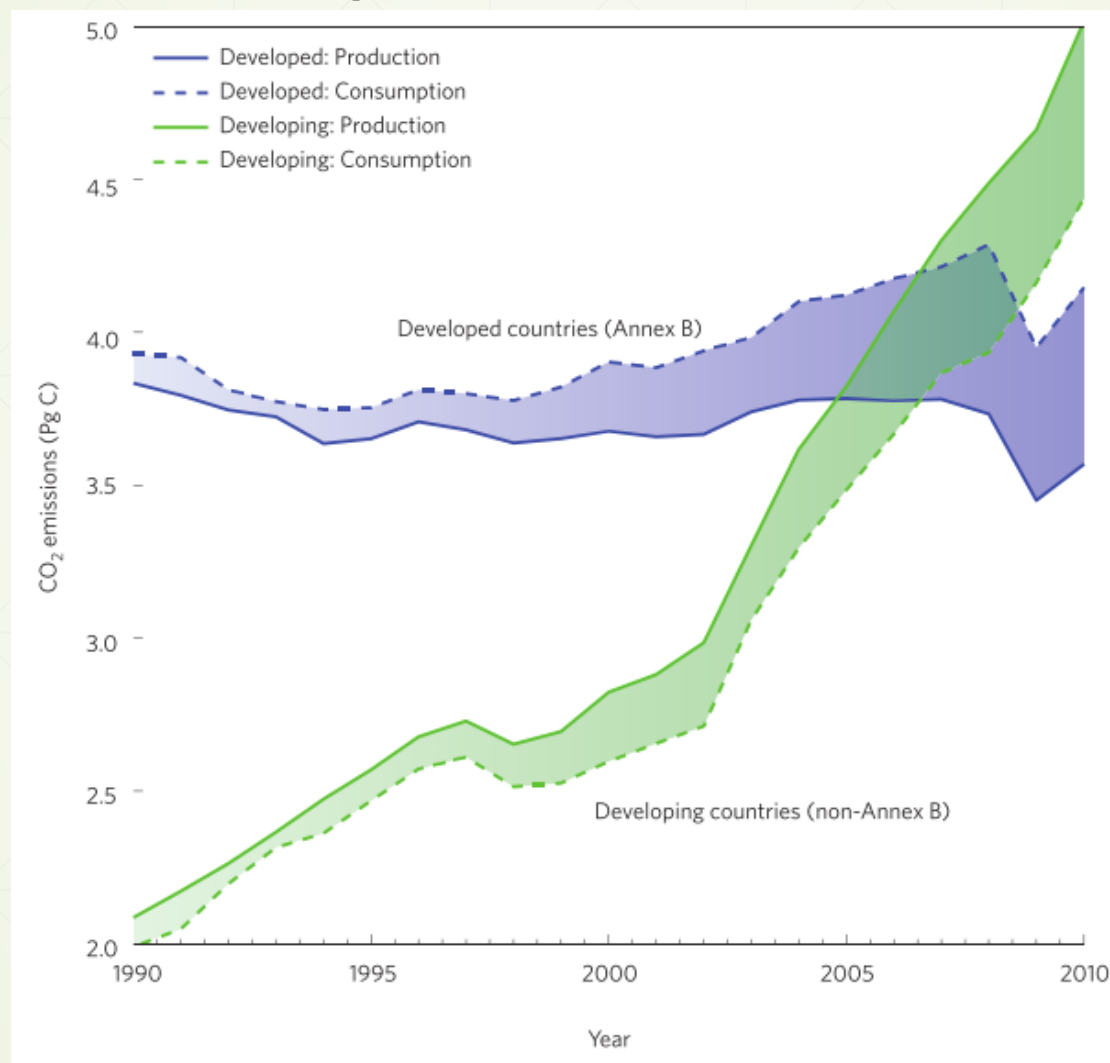


Climate change basics

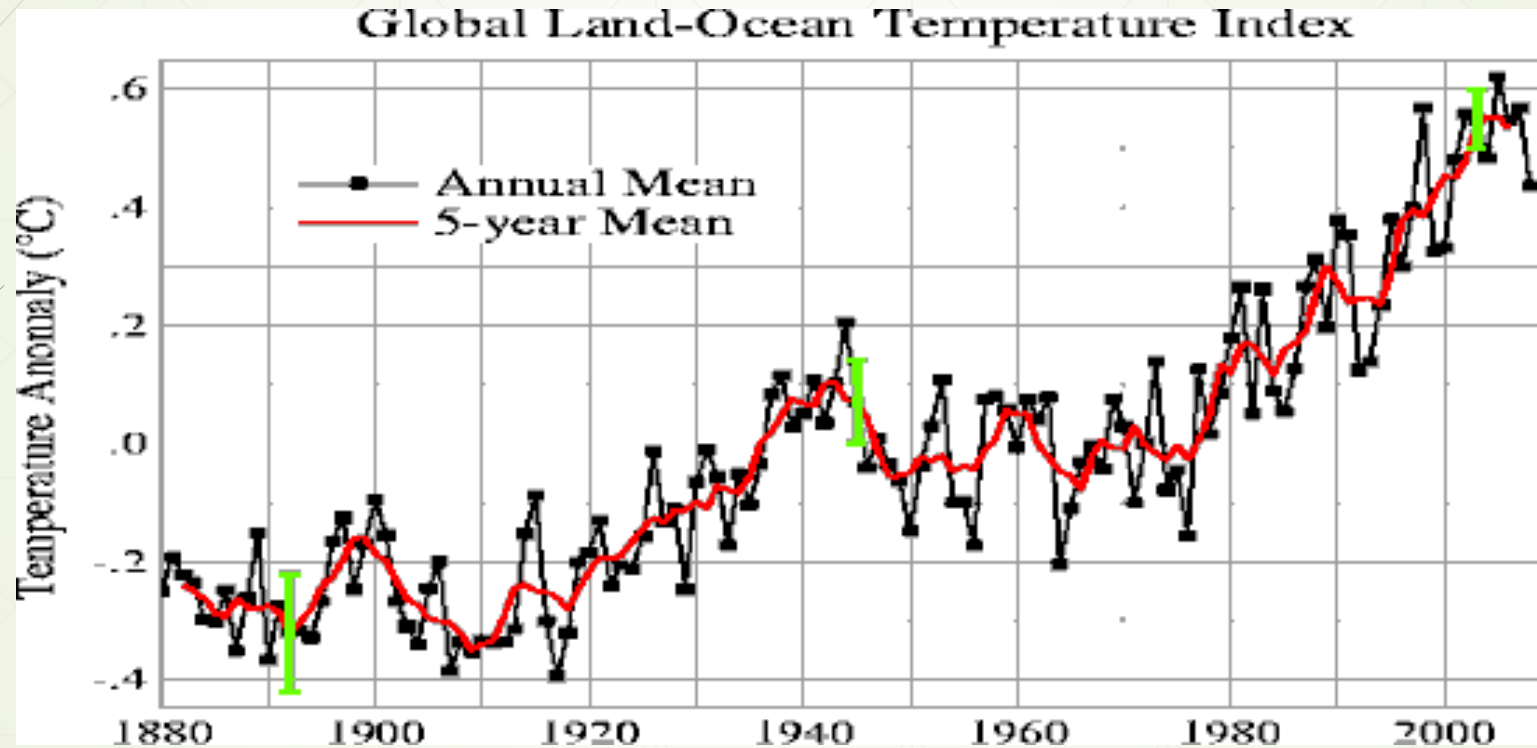
Greenhouse gas emissions have been rising



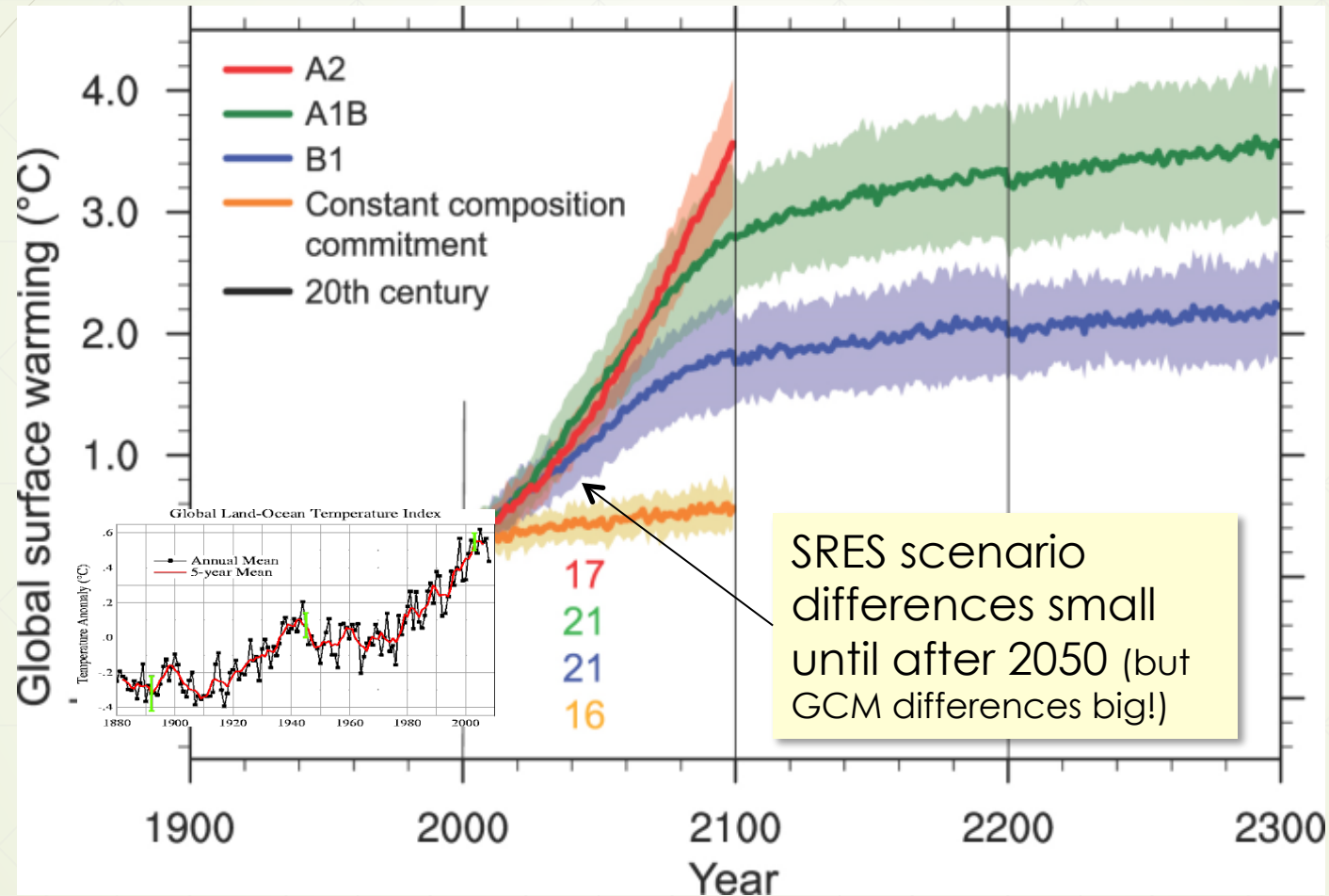
... and likely to rise more



It has been getting warmer...



... and could get a lot warmer!

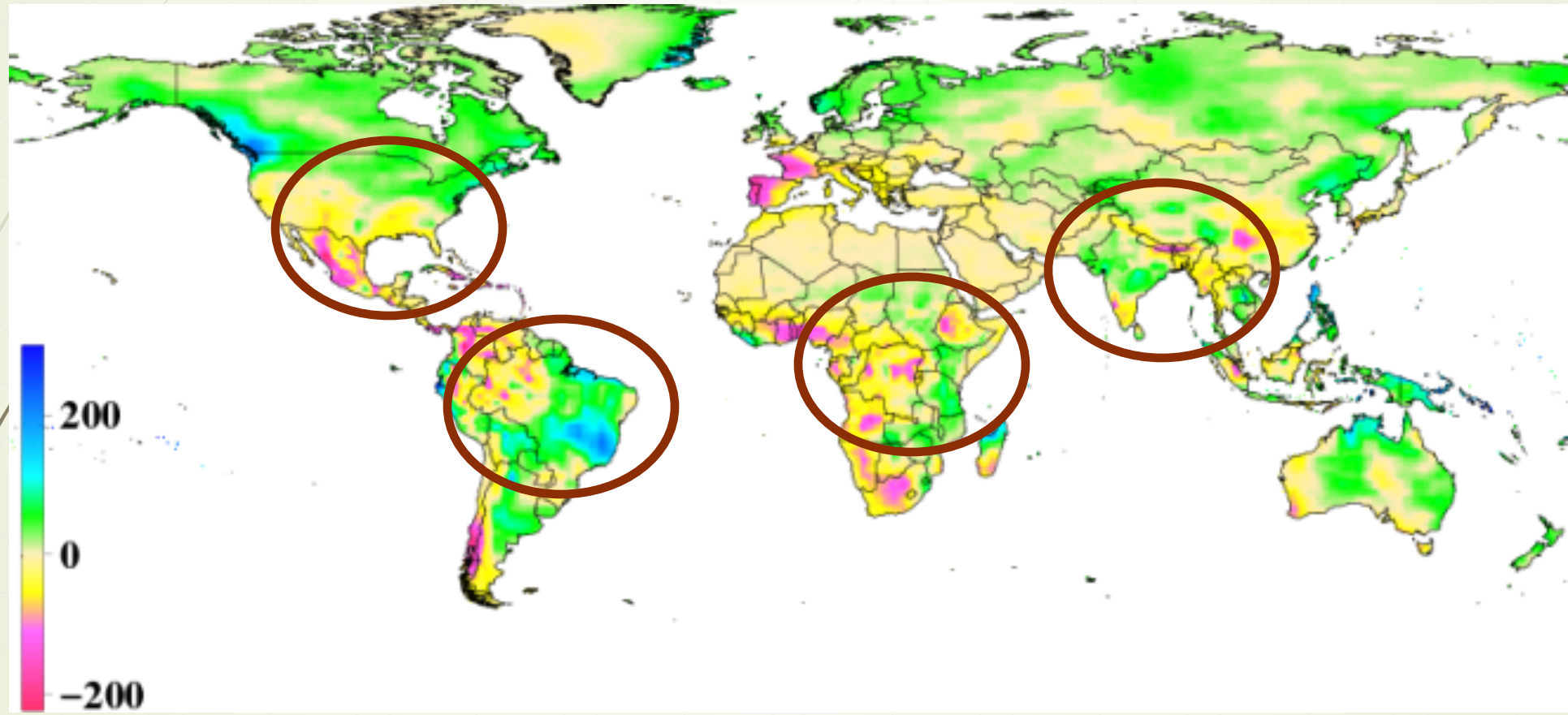




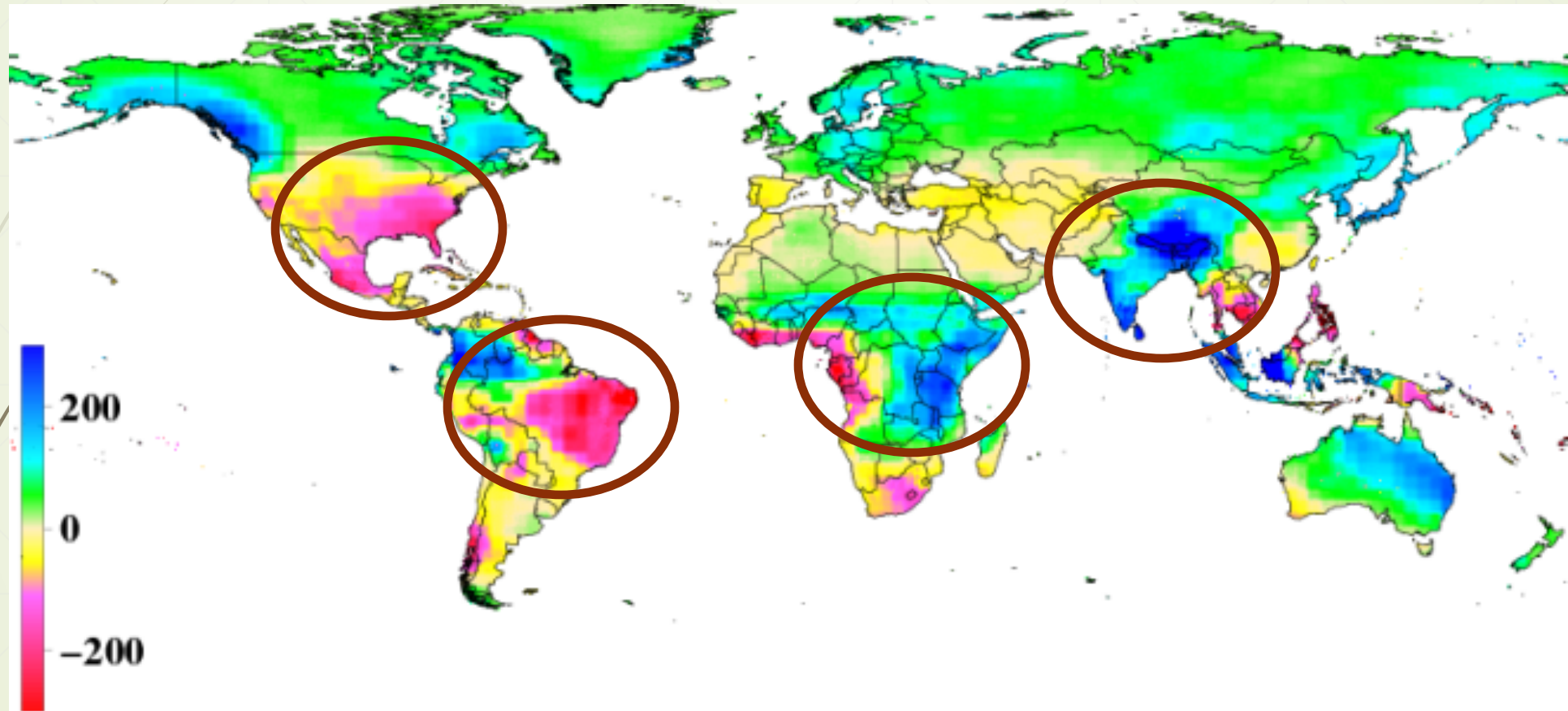
DIFFERENCES IN PRECIPITATION SCENARIOS ARE LARGE

Watch Sub-Saharan Africa, the Amazon, the
U.S. and South Asia

Change in average annual precipitation, 2000-2050, CSIRO GCM, A1B (mm)

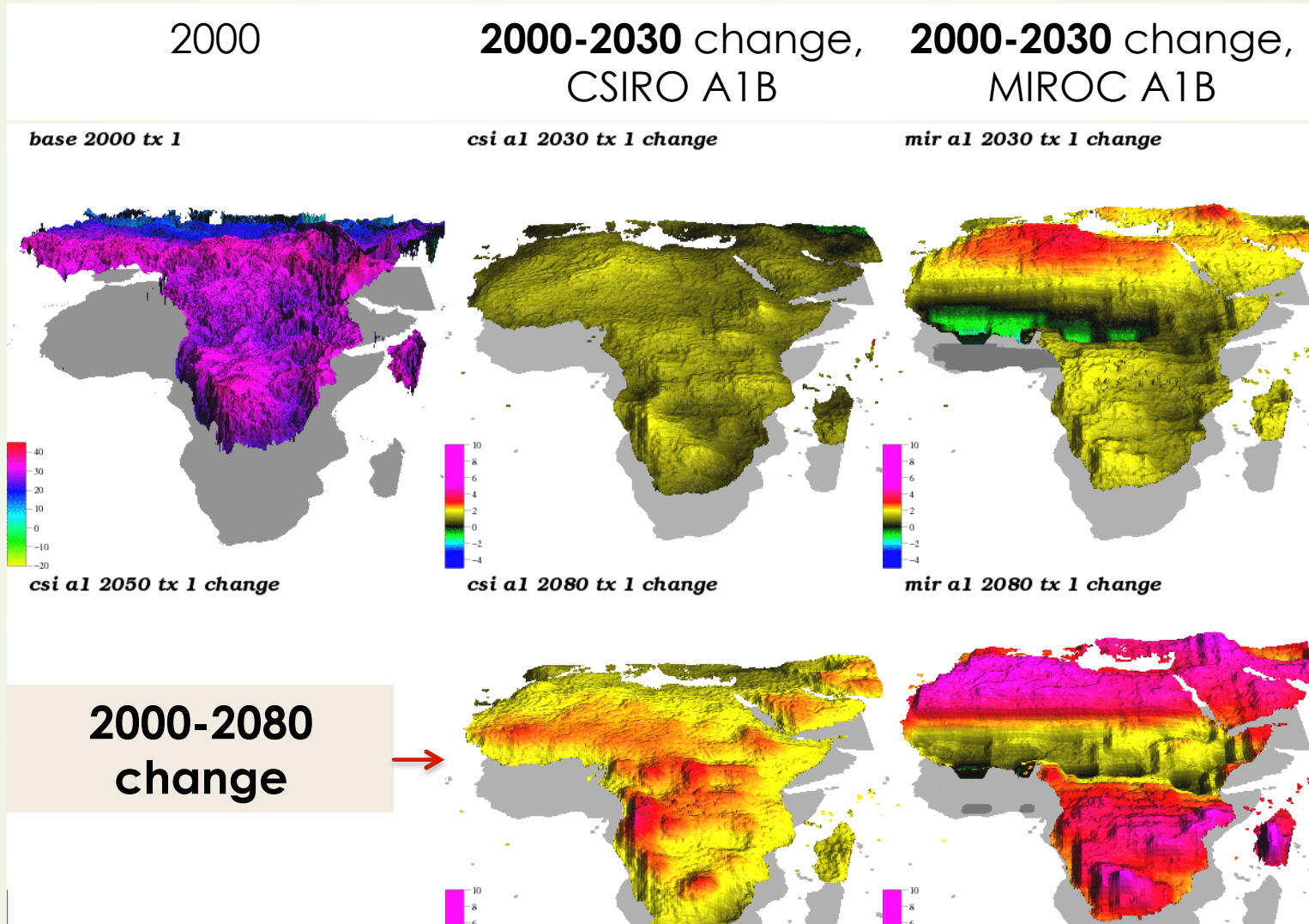


Change in average annual precipitation, 2000-2050, **MIROC** GCM, A1B (mm)



Temperature scenarios vary as well

Monthly maximum temp change scenarios, MIROC and CSIRO GCMs



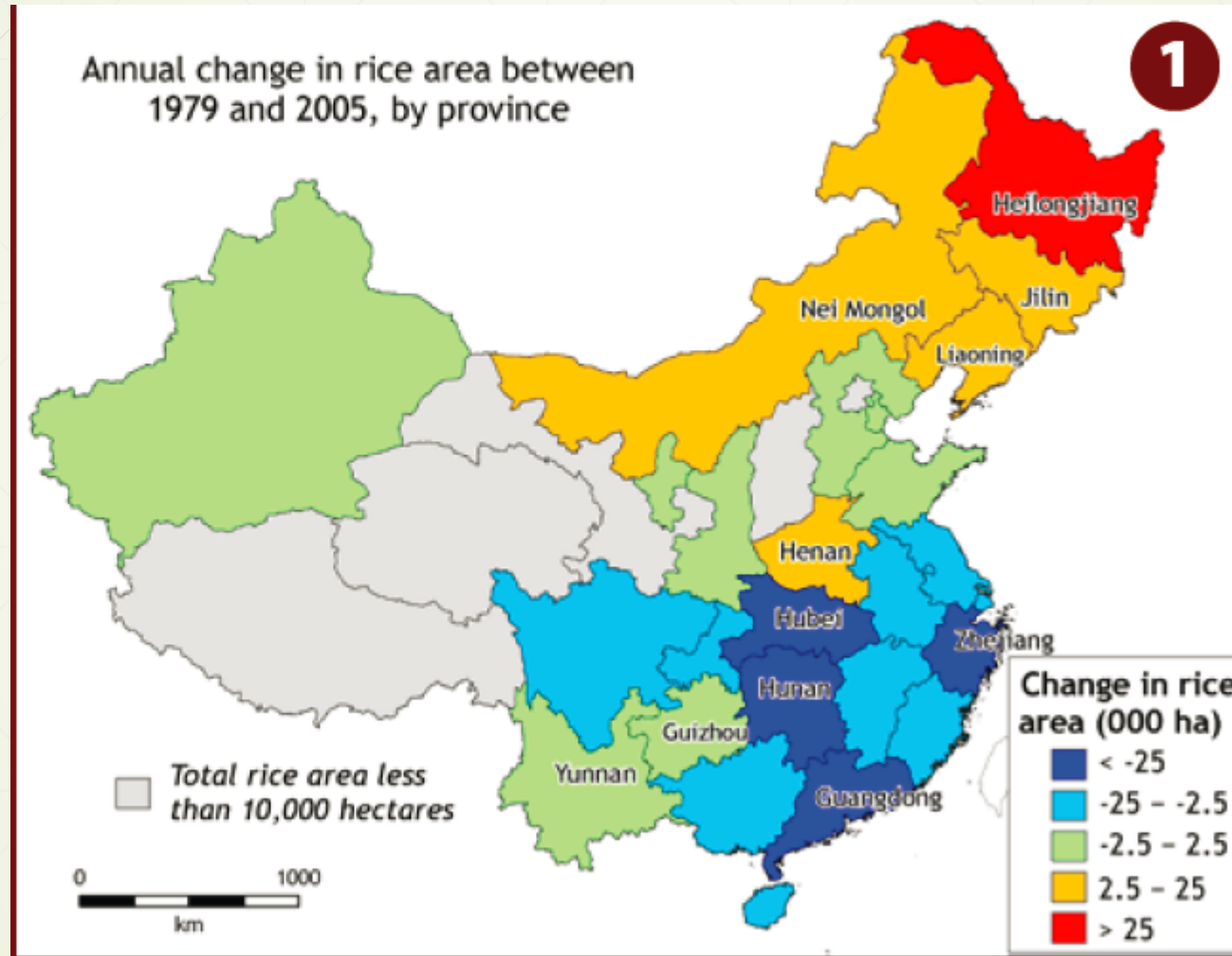
See

<http://www.ifpri.org/book-775/climate-change/>



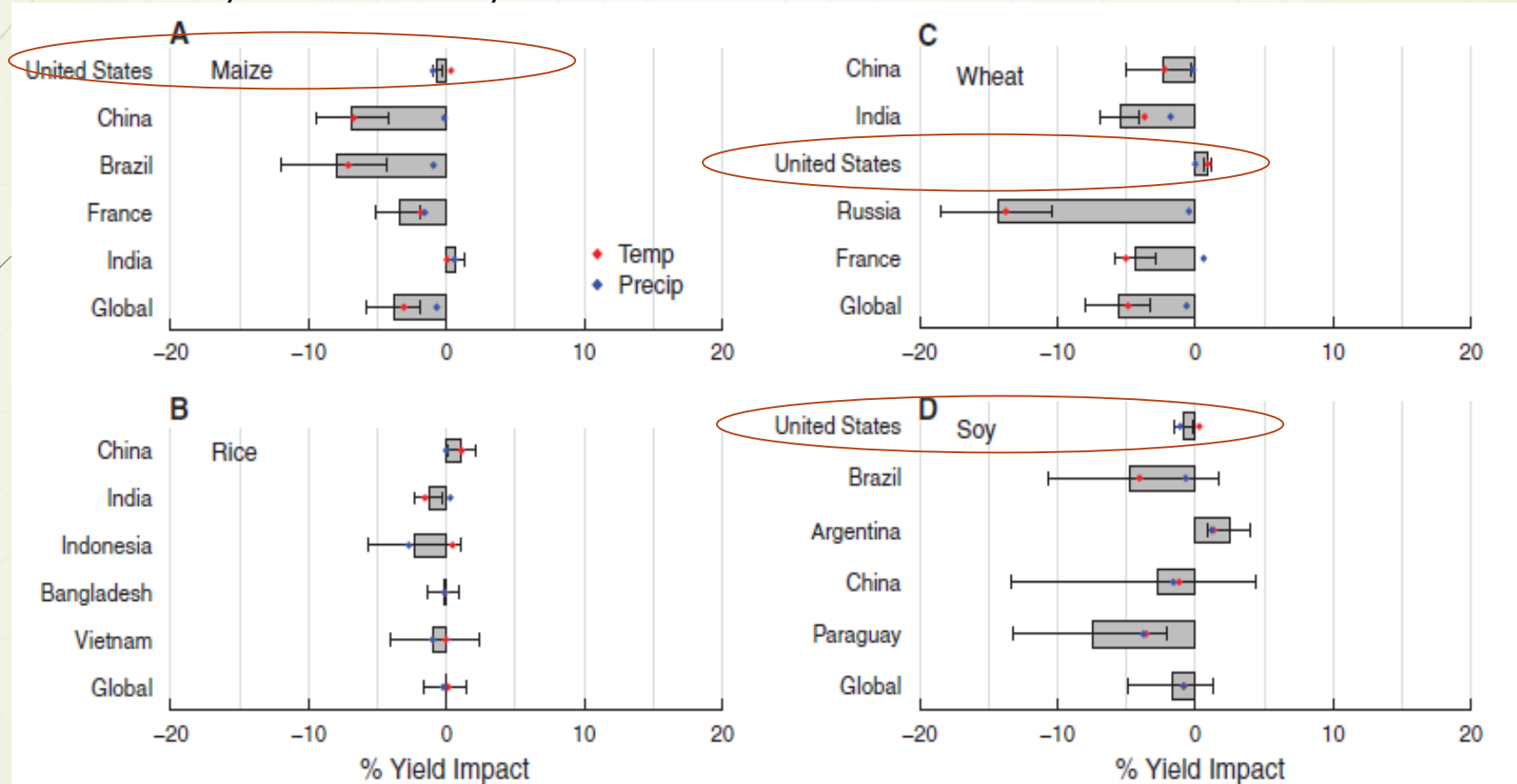
Climate change has already
affected agriculture

Chinese rice production has shifted north



Climate change has already offset research productivity in many places, except US

Estimated net impact of climate trends for 1980-2008 on crop yields, divided by the overall yield trend

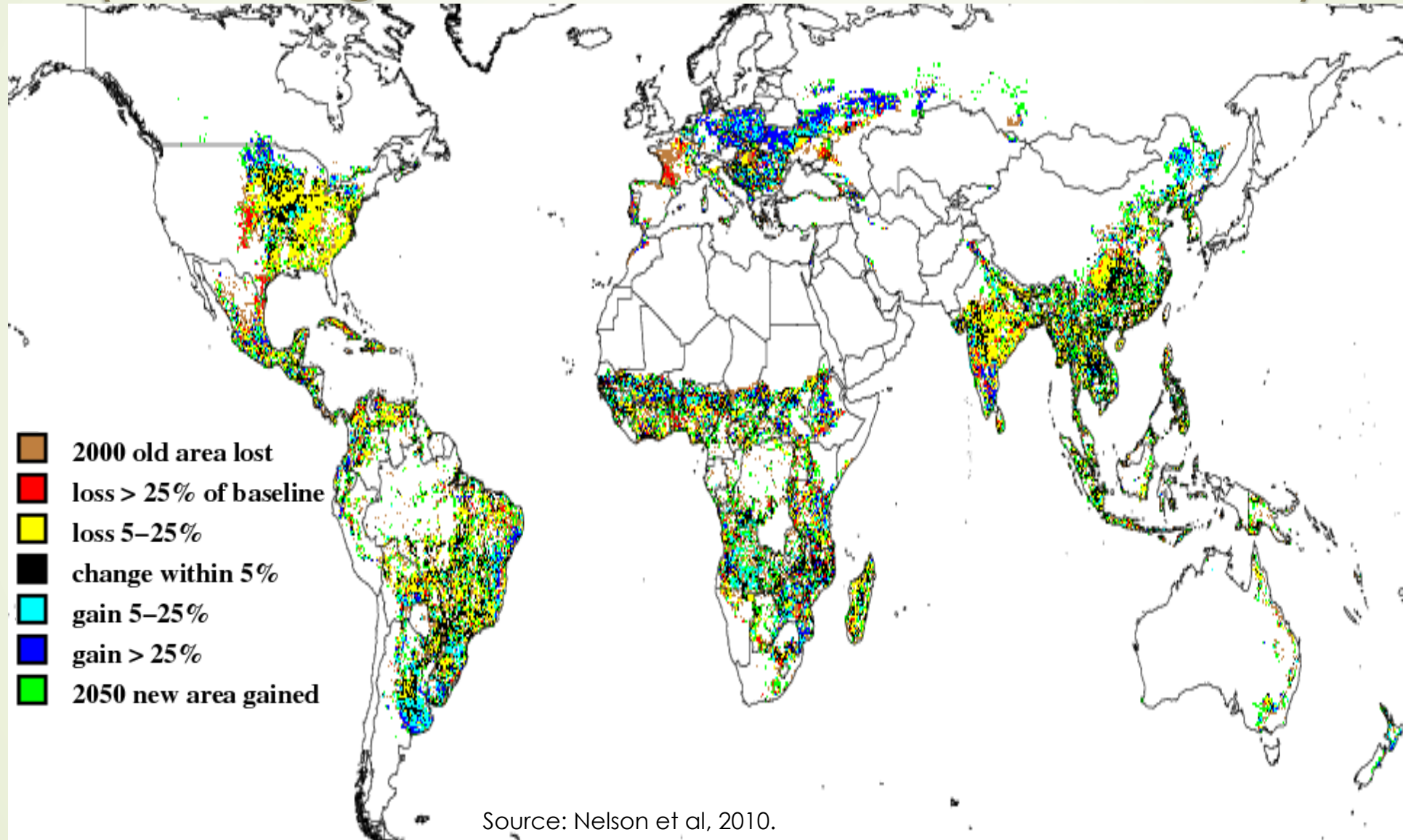




But the future impacts of climate change on agriculture could be much greater

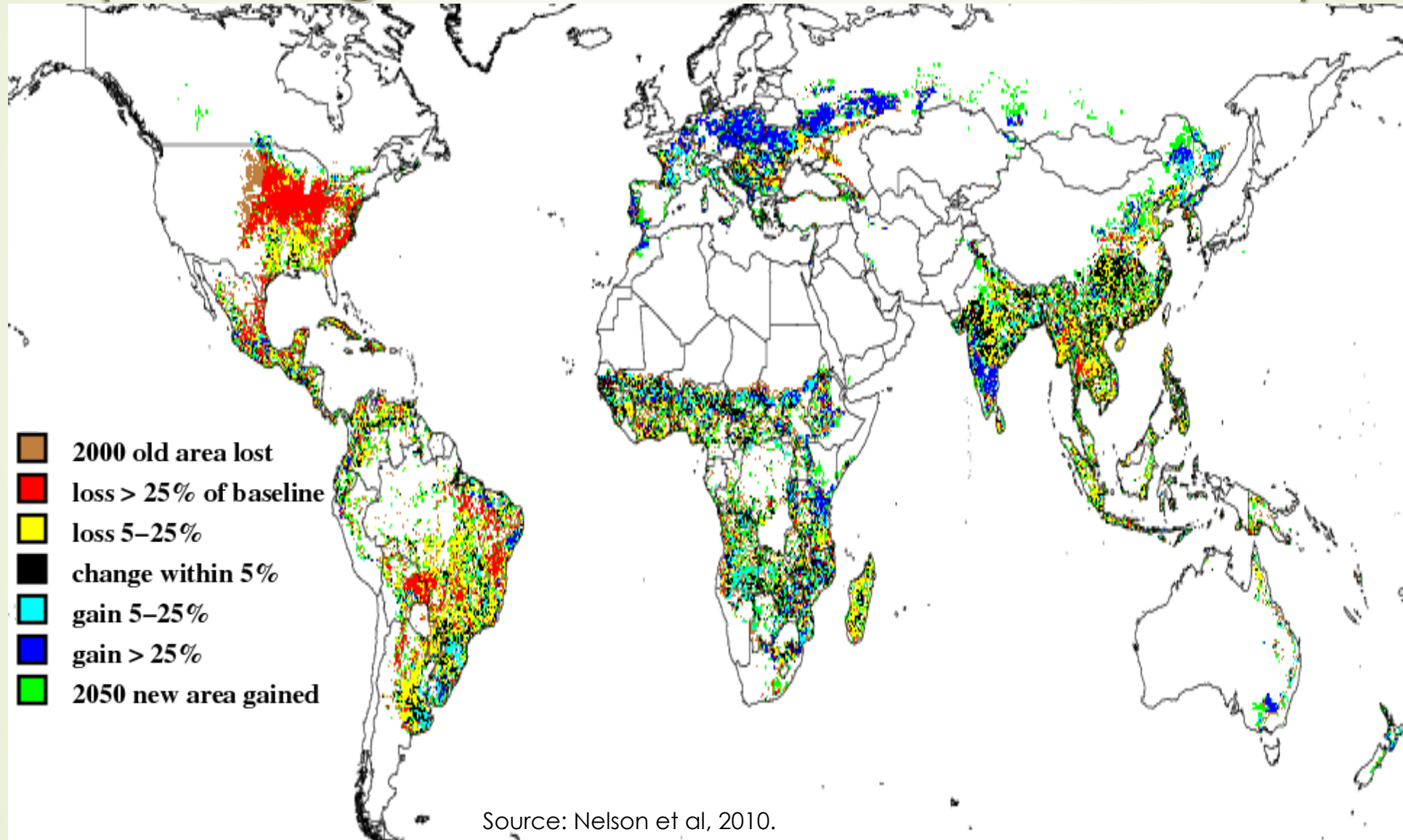
And with widely varying outcomes

Yield Effects, Rainfed Maize, CSIRO A1B (% change 2000 climate to 2050 climate)



Source: Nelson et al, 2010.

Yield Effects, Rainfed Maize, MIROC A1B (% change 2000 climate to 2050 climate)



Source: Nelson et al, 2010.

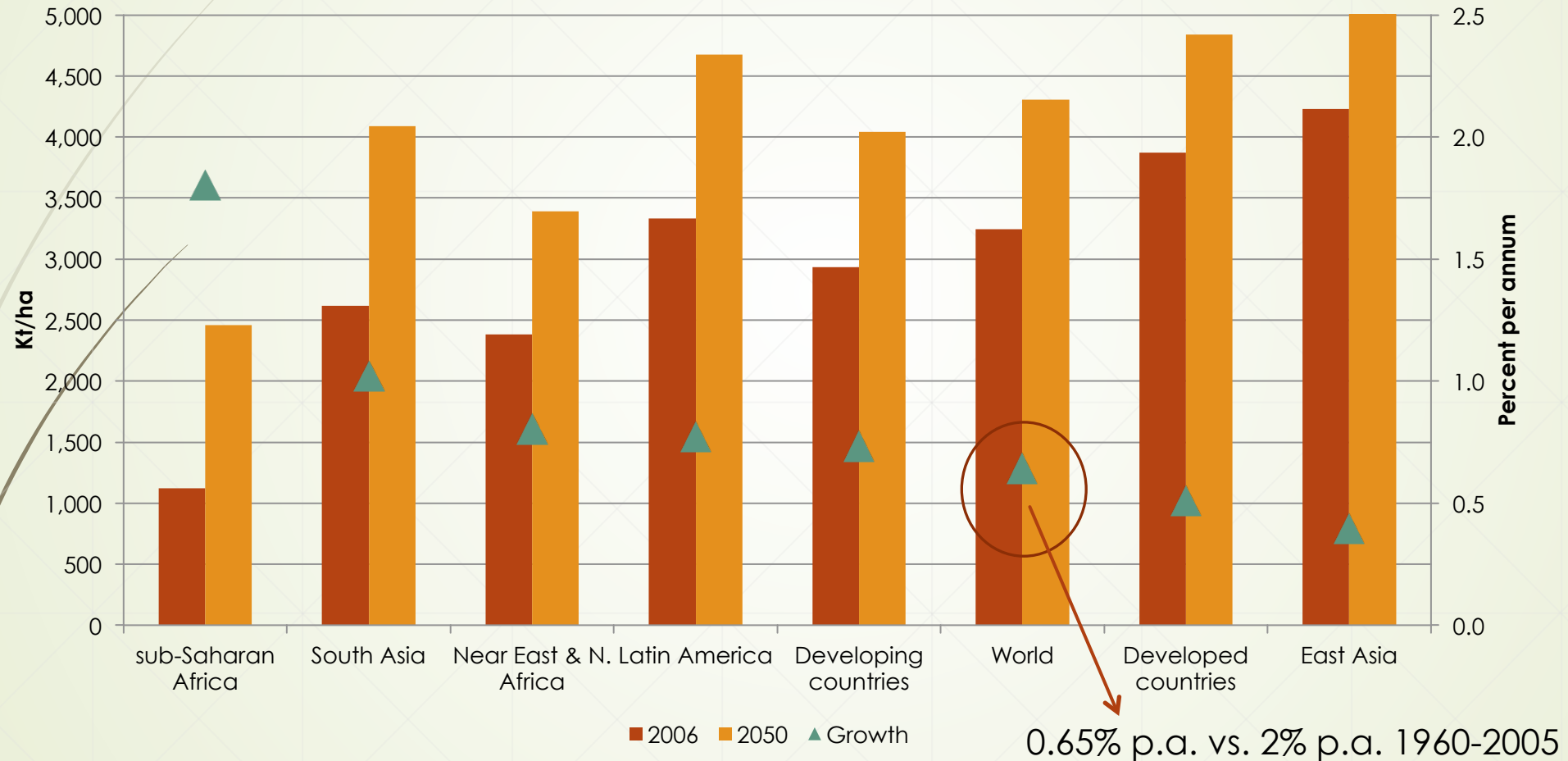
And it gets much worse after 2050

Climate change impacts on wheat yields with 2030, 2050, and 2080 climate (percent change from 2000)

Year	Developed		Developing	
	Rainfed	Irrigated	Rainfed	Irrigated
2030	-1.3	-4.3	-2.2	-9.0
2050	-4.2	-6.8	-4.1	-12.0
2080	-14.3	-29.0	-18.6	-29.0

FAO foresees modest cereal yield improvements to 2050 (but ignores climate change)

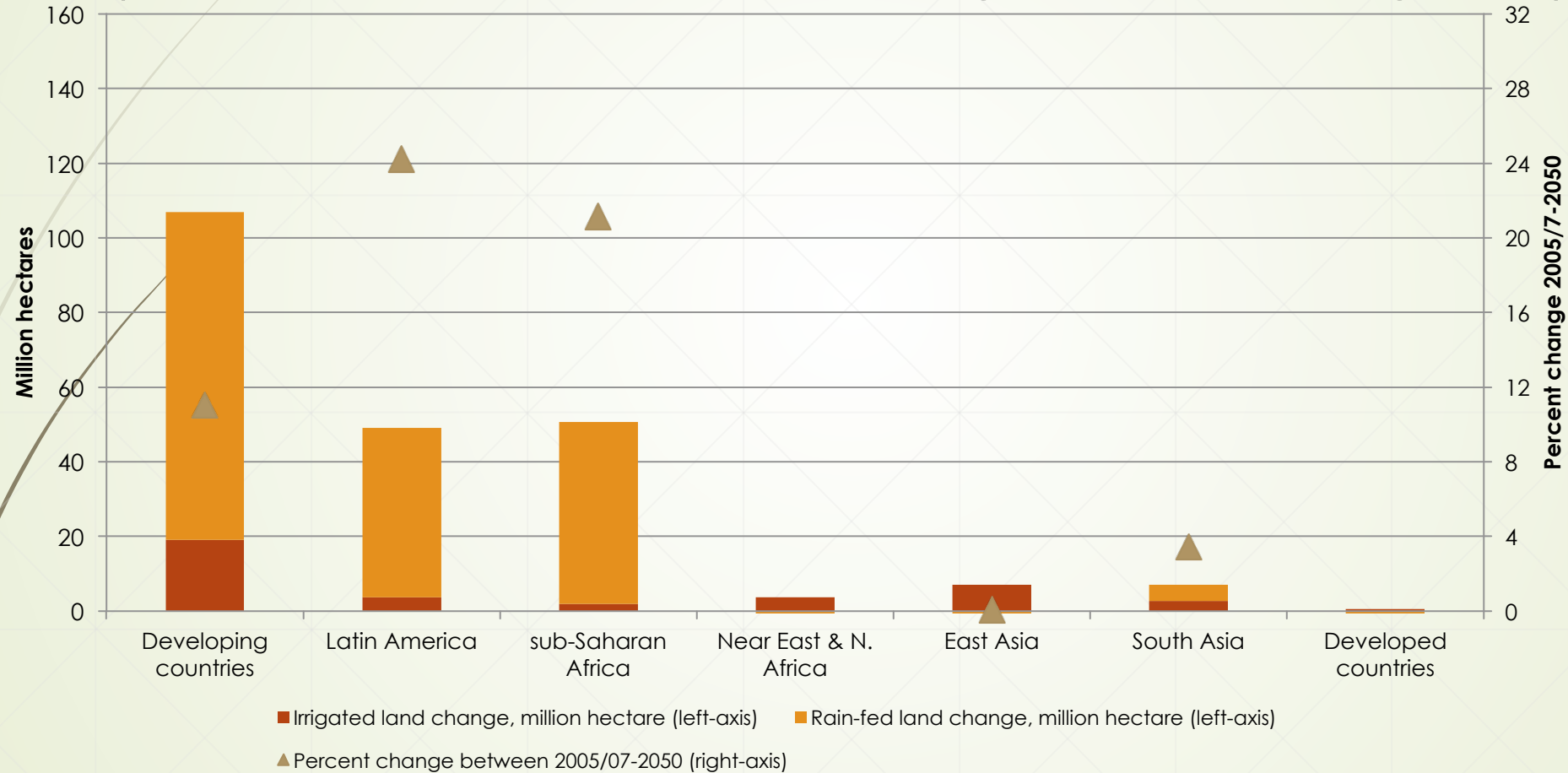
(kg/ha left-axis, growth percent per annum right-axis)



Source: Alexandratos and Bruinsma (2012).

Land use change continues in Latin America and Sub-Saharan Africa

(million hectares left-axis, percent change 2005/07 - 2050 right-axis)



Source: Alexandratos and Bruinsma (2012).



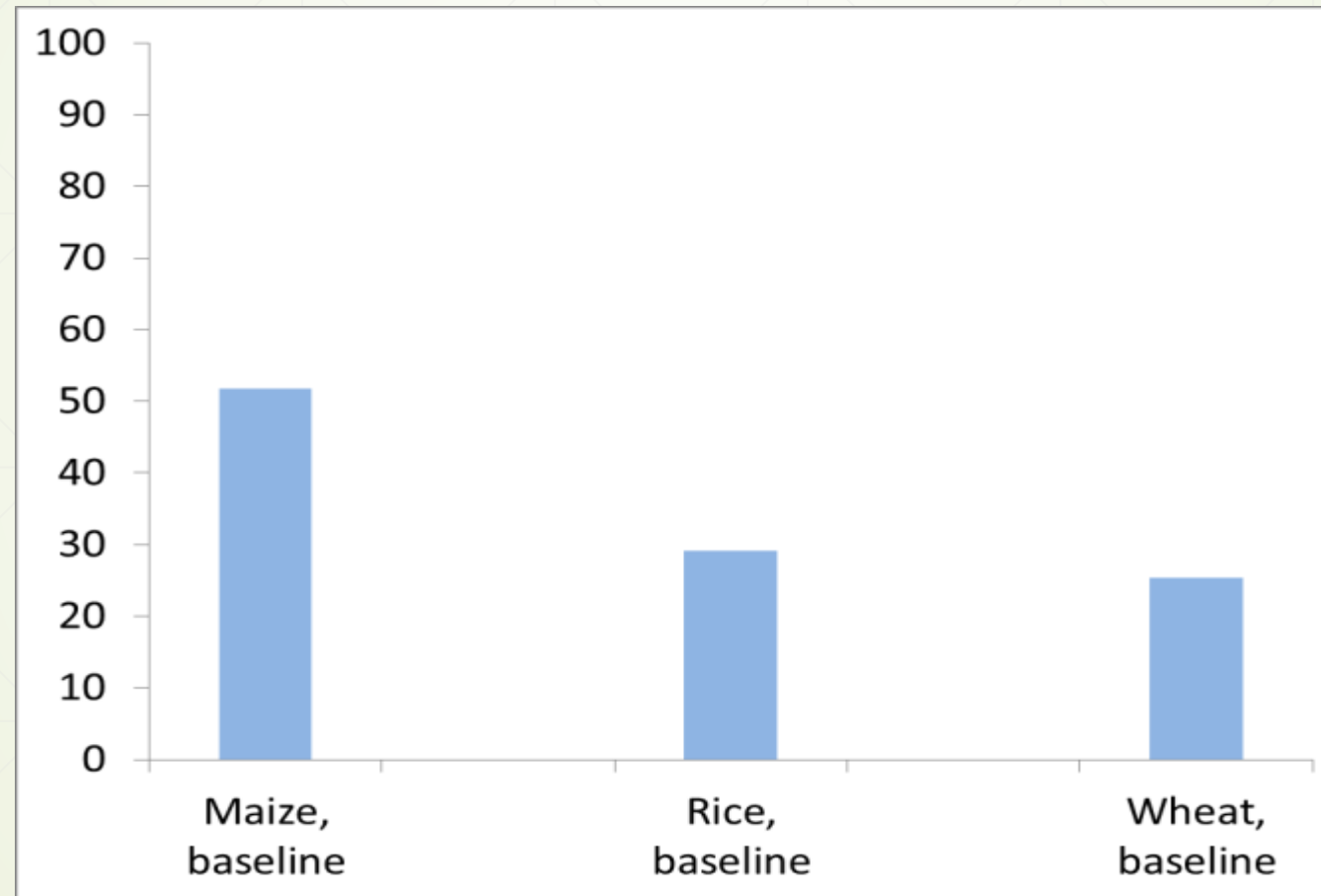
Food Security, Farming, and Climate Change to 2050: Key Findings

- Agricultural prices increase with GDP and population growth
- Prices increase even more because of climate change
- International trade is critical for adaptation

Source: Nelson et al, 2010.

Income and population growth drive prices higher

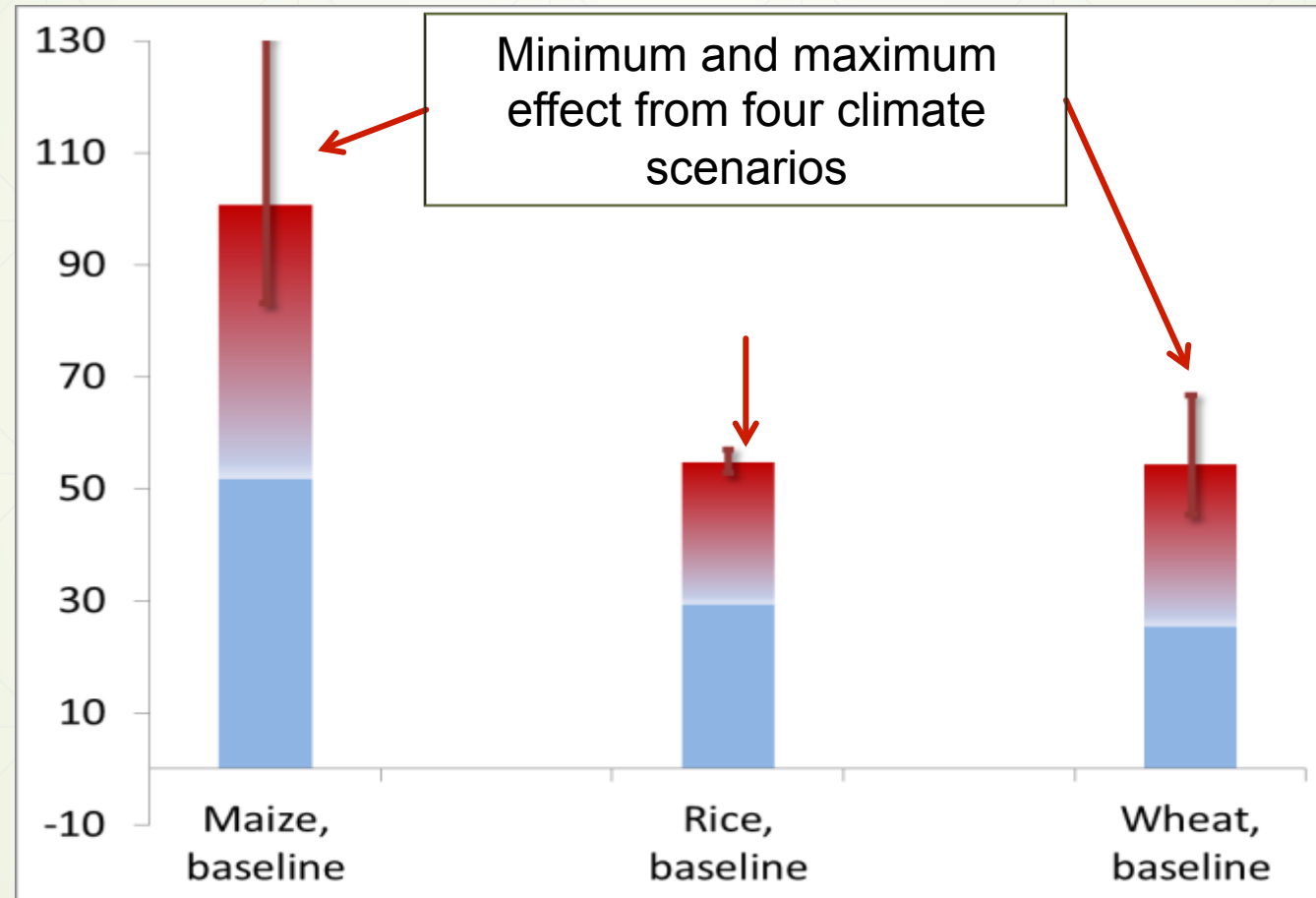
(price increase (%), 2010 – 2050, Baseline economy and demography)



Source: Nelson et al, 2010.

Climate change increases prices even more

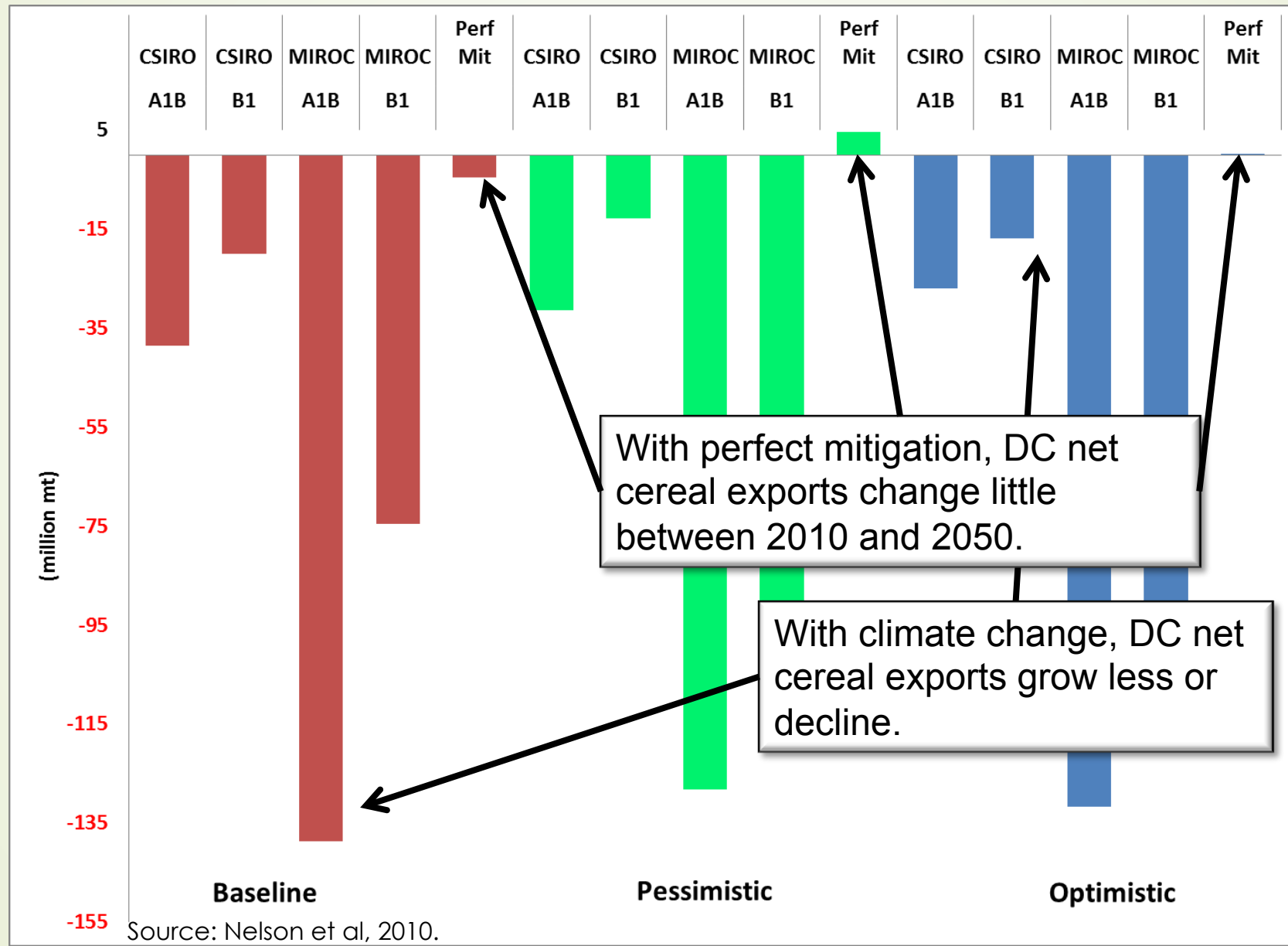
(price increase (%), 2010 – 2050, Baseline economy and demography)



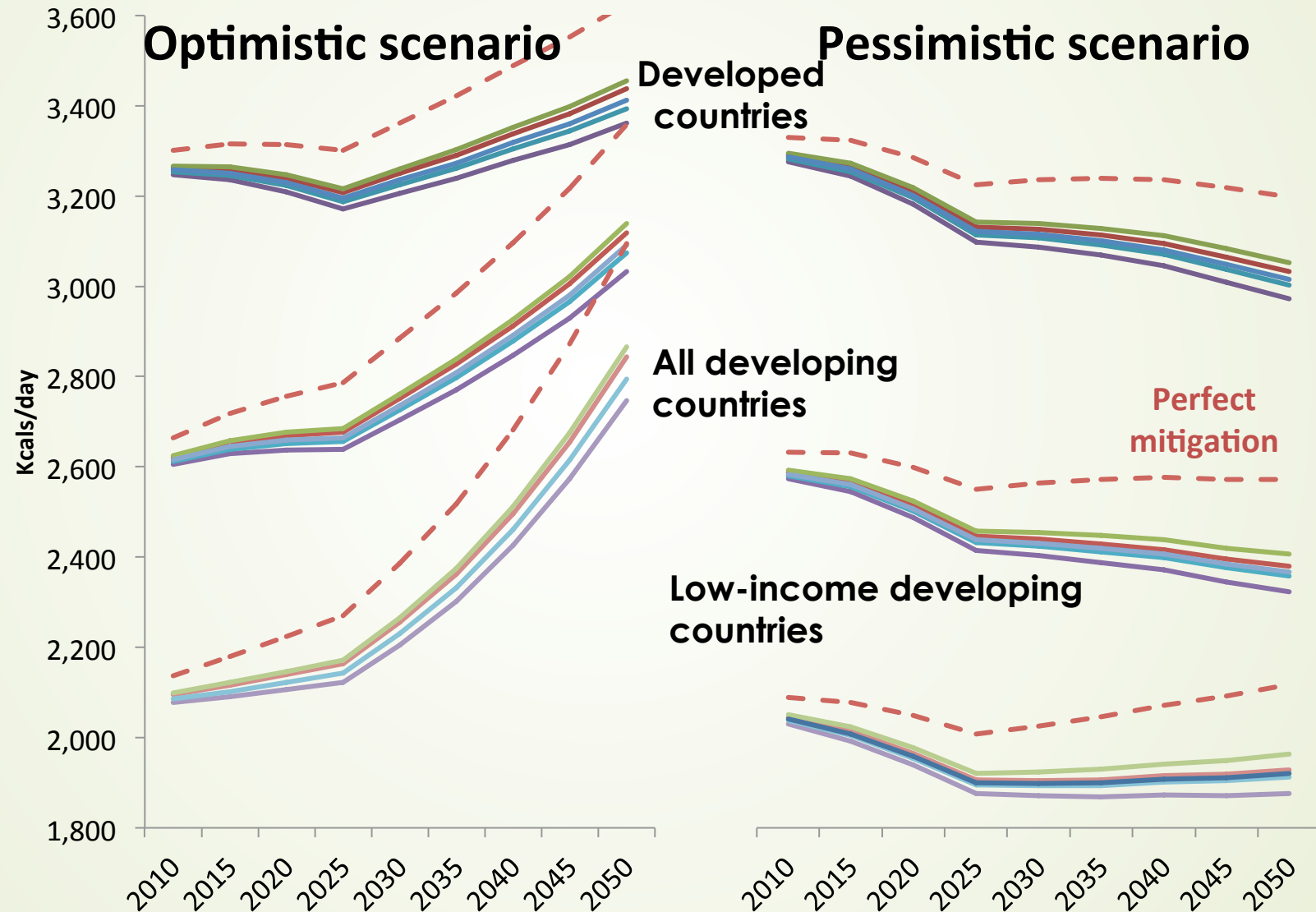
Source: Nelson et al, 2010.

Trade is a crucial adaptation mechanism

Developed country change in net exports of cereals, 2010-2050 (million mt)



Income and population growth are more 'important' than climate change to 2050 (average kilocalories per day)



Source: Nelson et al, 2010.



Three main messages to policy makers

- In low-income countries, sustainable development is a more important priority than climate change adaptation *today*
 - Prepare *today* for higher temperatures and changes in precipitation in all sectors *tomorrow*
 - Invest more in *capacity* to adapt agriculture
 - Keep international trade relatively free from barriers
 - Collect better data today and tomorrow on existing situation and practices
 - Weather, land cover, water availability, prices, practices
-



What is missing in these scenarios?

- Climate change
 - Effects of increased ozone
 - Increasing extreme events
 - Effects of changes in pest pressure
 - Malnutrition
 - Calorie (and other nutrient) distribution to different groups
 - Modeling overnutrition
 - Sustainability
 - Definitions
 - Metrics
-



What about spices and climate
change?



Thanks!
