Supporting Profitability with Climate-Smart Agriculture

Gerald C. Nelson

Professor Emeritus,
University of Illinois, Urbana-Champaign

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Climate change affects profitability

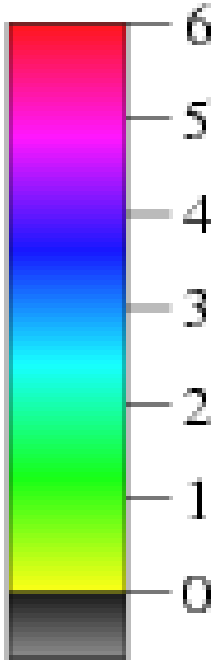
- Reduced and more variable yields from weather changes
- More pests and diseases
- More costs from adaptation expenses
- Higher prices for products
- GHG mitigation payments/charges

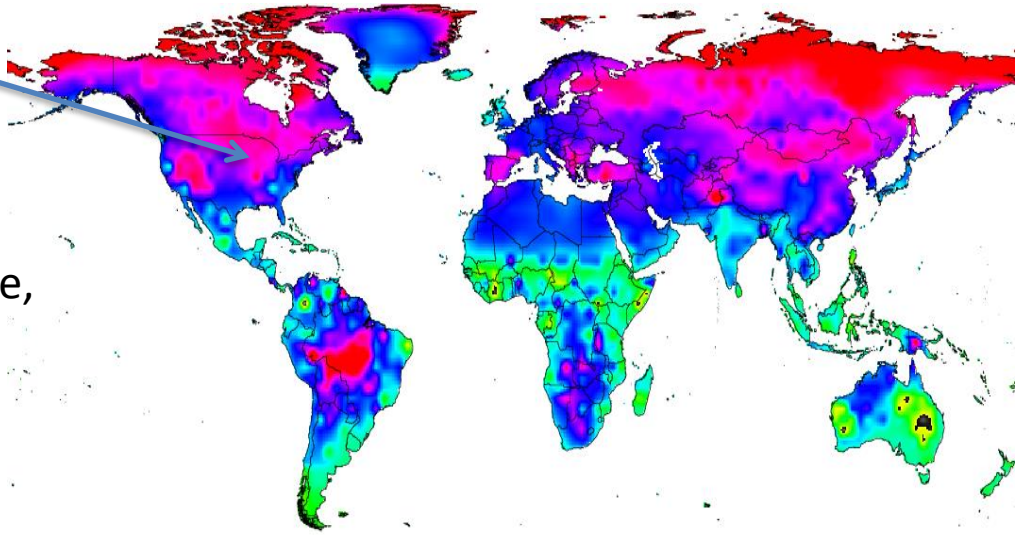
CLIMATE CHANGE AFFECTS YIELDS

Temperatures increase with climate change

About
10°F

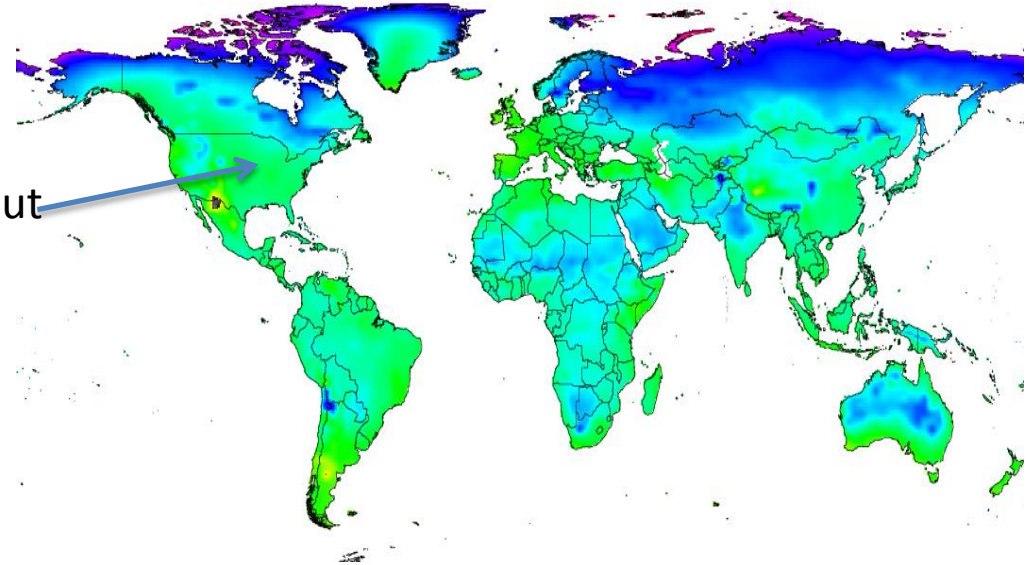
(Change in average maximum temperature, 2000 – 2050 °C)





MIROC climate model, RCP 8.5

About
4°F

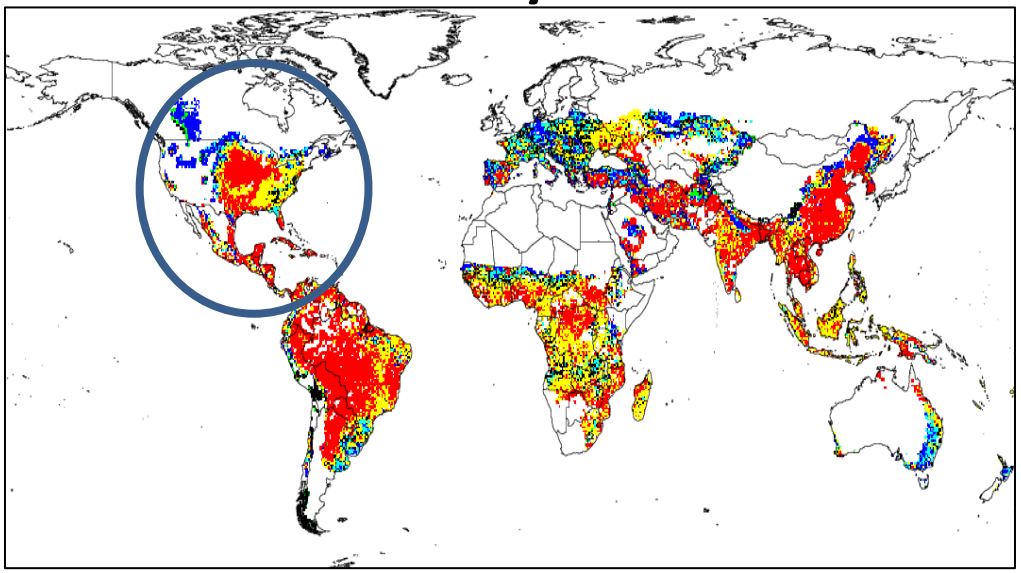


GFDI climate model, RCP 8.5

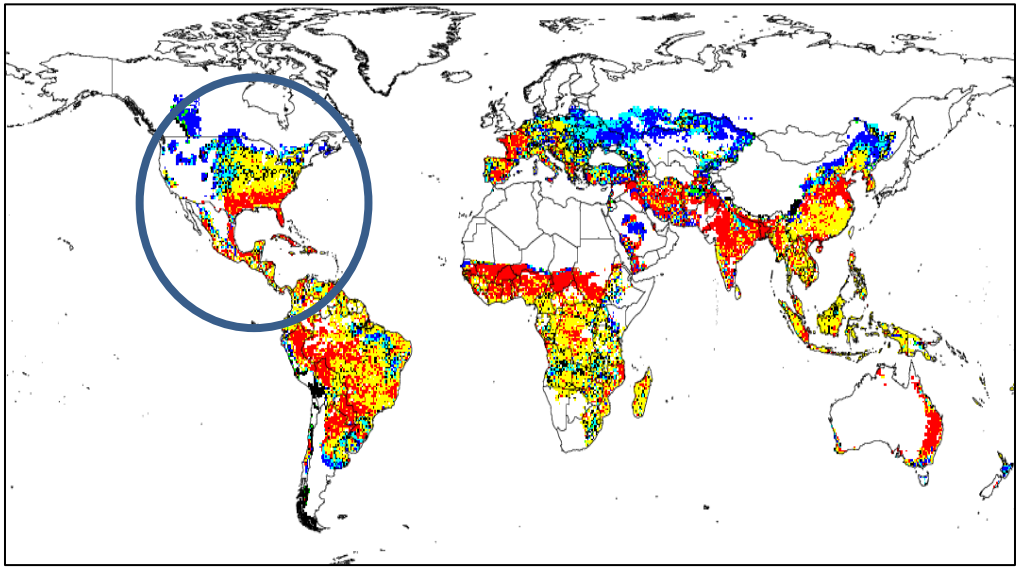
Rainfed corn yield change is mostly negative with today's varieties

Yield change, 2000 – 2050 weather

- old area lost
- loss > 25% of base
- loss 5–25%
- change within 5%
- gain 5–25%
- gain > 25%
- new area gained

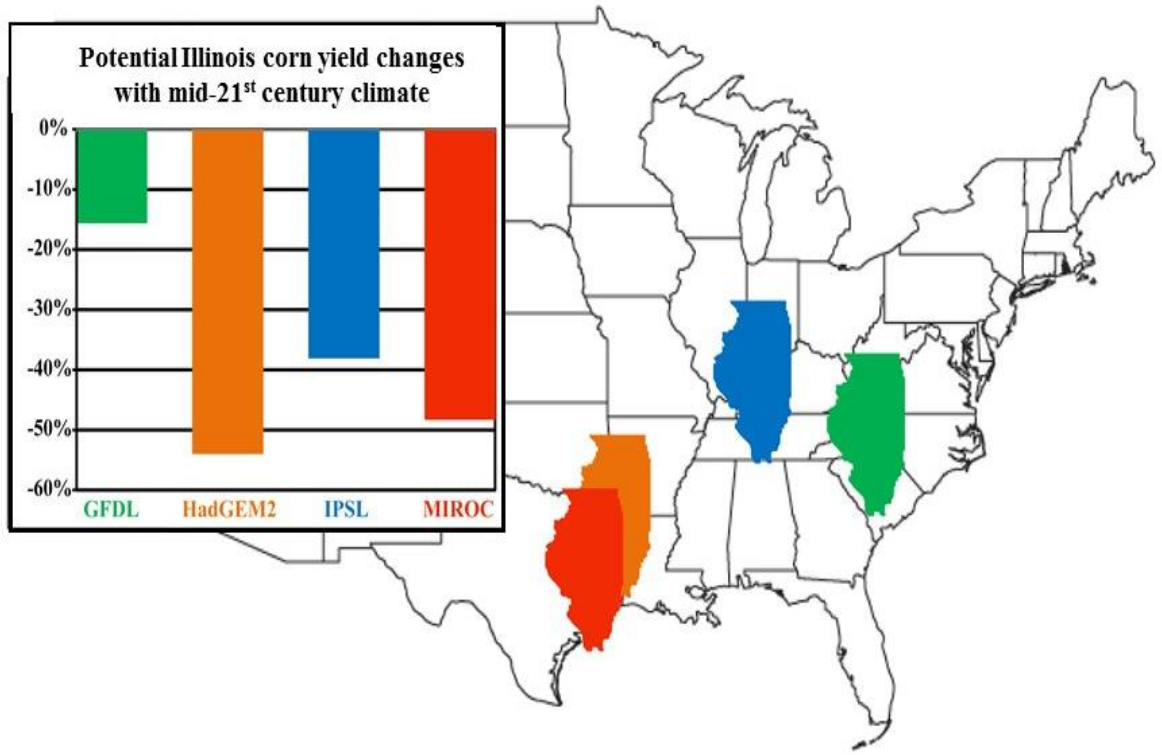


MIROC climate model, RCP 8.5



GFDI climate model, RCP 8.5

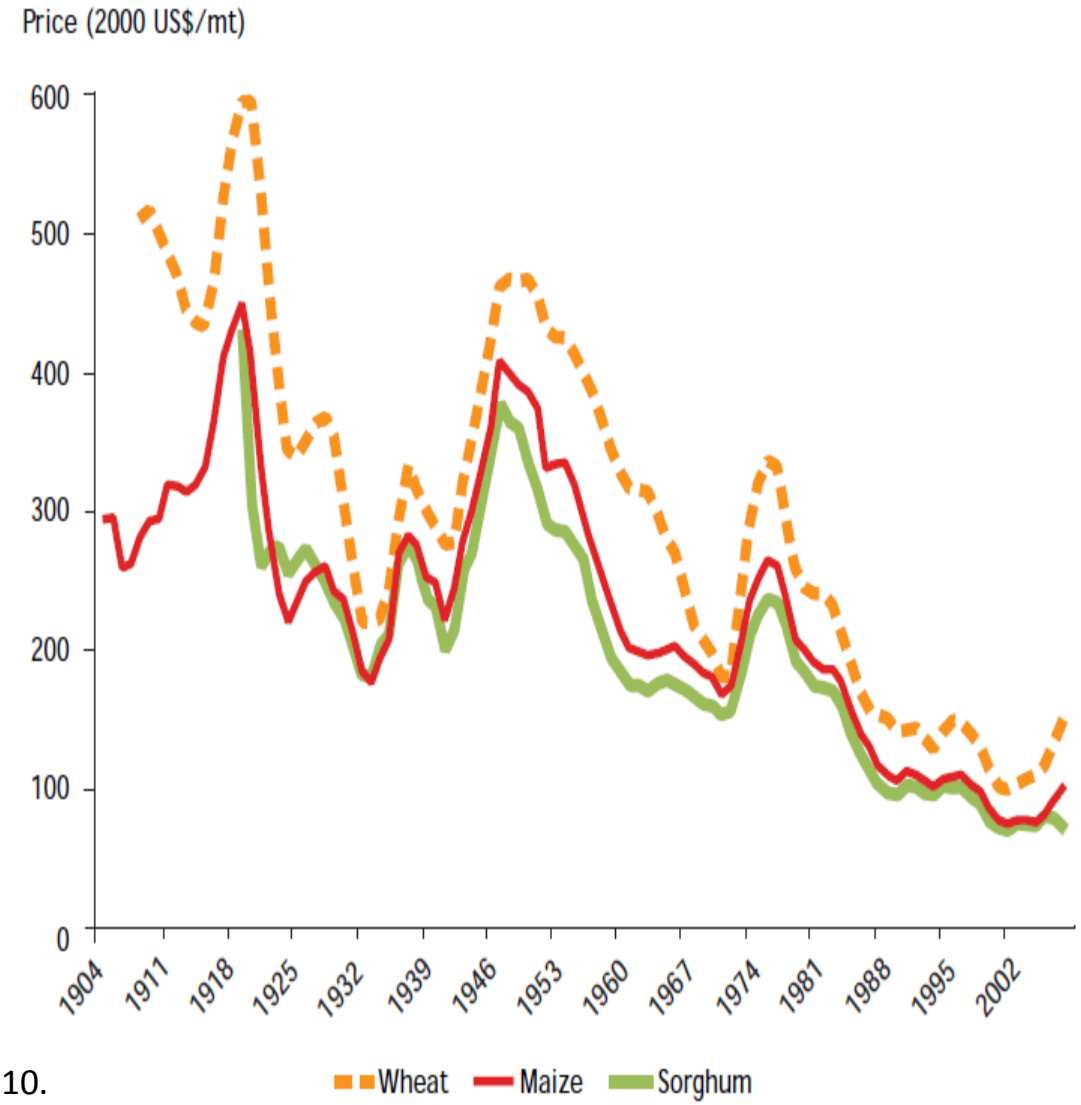
Another take on climate change uncertainties: Illinois will get hotter but could get wetter or drier



Source: Gustafson, et al., 2015, under review

THE PRICE TRENDS OF THE 20TH CENTURY ARE LIKELY TO REVERSE WITH CLIMATE CHANGE

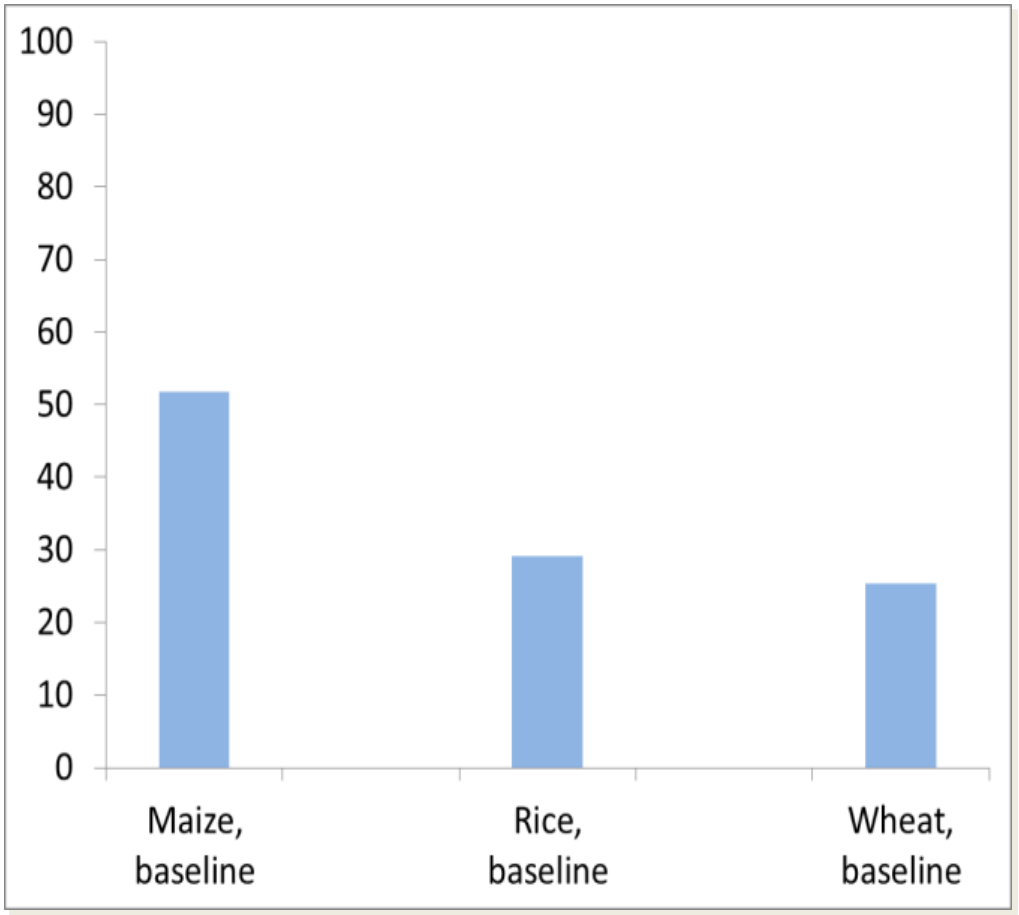
Crop prices declined throughout the 20th century



Source: Nelson et al, 2010.

Income and population growth will likely push prices up in the 21st century

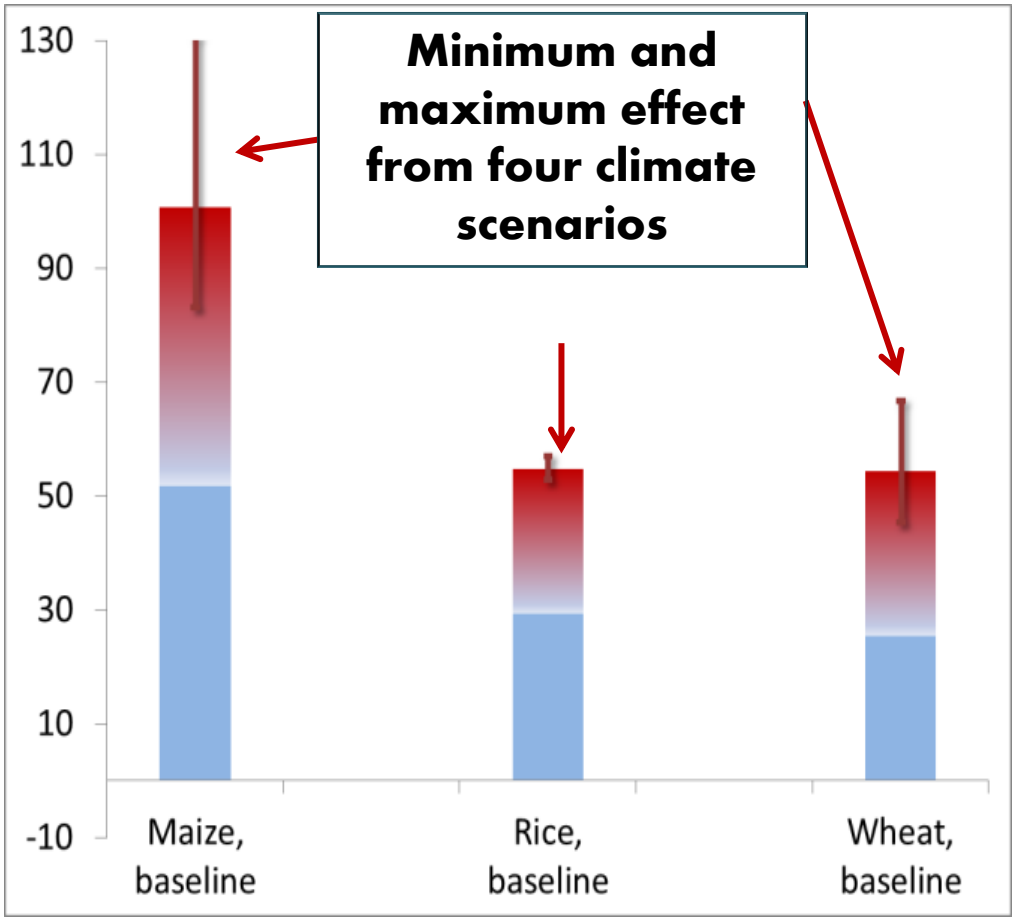
(price increase (%), 2010 – 2050, Baseline economy and demography)



Source: Nelson et al, 2010.

Climate change will push them up more

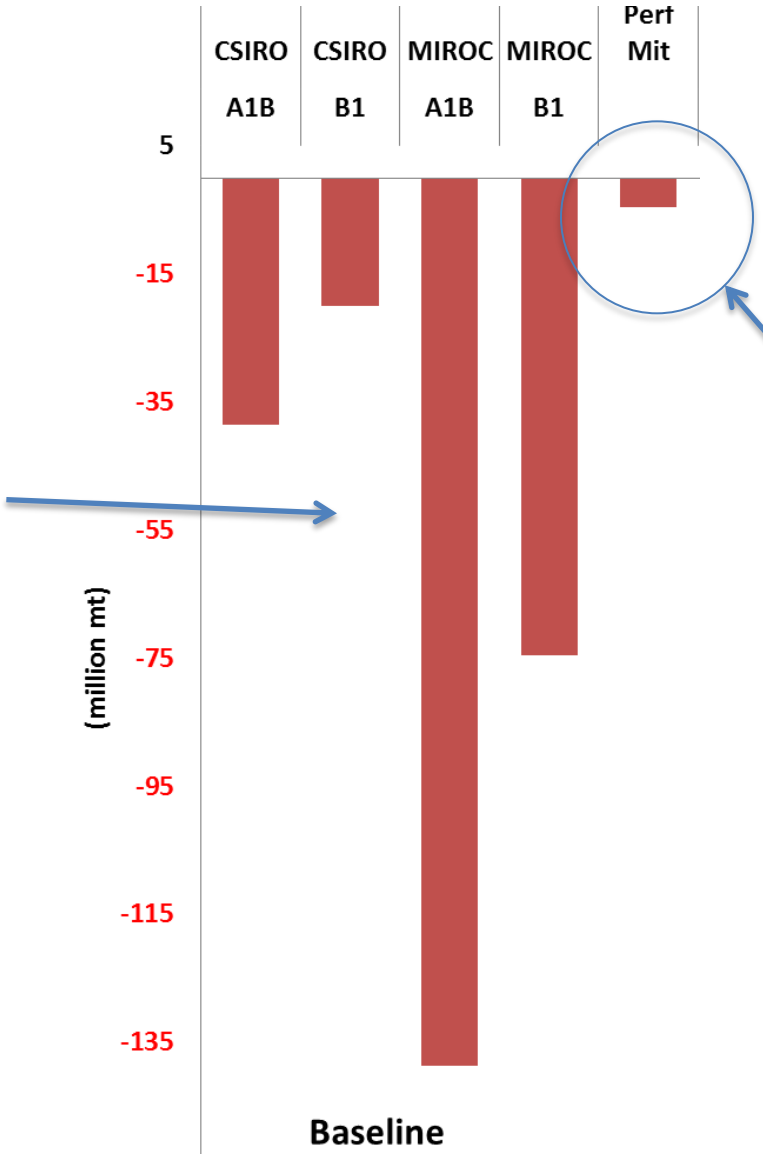
(price increase (%), 2010 – 2050, Baseline economy and demography)



Source: Nelson et al, 2010.

CLIMATE CHANGE ALTERS GLOBAL CEREAL TRADE

Change in Net Exports of Cereals from Developed Countries (2010-2050, million mt)



With climate change, exports decline.

With no climate change, exports would remain about the same

Responding to Climate Change for Profit Today and Tomorrow

- Short run – plan for today's weather
- Medium run
  - Get best science about range of potential changes in weather ***in your area*** (means and variability)
  - Explore options for low hanging fruit (change in variety, crop mix, easy management practices)
- Long run
  - Plan capital investments that are robust to a range of potential weather changes
  - Consider activity changes that are weather-robust

Examples

- Iowa
  - Climate change has already meant more early season heavy rains
  - Responses – more tile drainage; improved seed treatments; more capacity for rapid planting
- Illinois
  - Climate change has meant longer growing season
  - Response – more double cropping
    "in double cropping areas, growers have the season to produce a crop that can nearly rival full-season beans if the weather cooperates, so it pays to invest in the right agronomy" (*Dr. Daniel Davidson, http://ilsoyadvisor.com)*

What about the West?

- Prepare for more water scarcity
  - Give water rights holders economic incentives to conserve
  - Recognize that water can flow uphill if attracted by enough money
  - Find profitable low-water products and management techniques
- Prepare for higher temperatures
- Prepare for more weather extremes

POLICY ACTIONS TO IMPROVE PROFIT

Selected Policy Recommendations from the 2014 Chicago Council Report*

1. Bolster location-specific research on climate change impacts and solutions, increase funding for data collection, and partner widely
2. Include climate change adaptation in trade negotiations

* Advancing Global Food Security in the Face of a Changing Climate, Available at http://bit.ly/1j6YFhK

1. BOLSTER RESEARCH ON CLIMATE CHANGE IMPACTS AND SOLUTIONS, INCREASE FUNDING FOR DATA COLLECTION, AND PARTNER WIDELY

Recommendations

- Fund more and varied biological research on adaptation and mitigation
  - But don't lose track of need for greater productivity
- Develop more sophisticated models and collect better data
- Upgrade and strengthen university and private-sector partnerships
- Recognize/take advantage of the global nature of the problem

Progress

- USDA Foundation for Food and Agricultural Research
  - Public-private partnership for agricultural research
  - $200 million from federal sources to be matched by $200 million from non federal sources
- USDA Regional Climate Hubs
  - Bringing information to the decision-making scale
- USAID Innovation Labs
  - Applying US university intellectual prowess to food security challenges
- Growing number of university-based food security initiatives
- International
  - Global Research Alliance on Agricultural Greenhouse Gasses
  - Climate Smart Alliance

Examples of specific research topics

- Tolerance to higher temperature and ozone
- Resilience to increased variability
- More varied farming practices that leverage system dynamics
- Management strategies for combating pests and diseases
- Increased productivity and food use of orphan crops

Examples of blue sky research opportunities

- Transfer nature's improved photosynthesis to more plants (C3 to C4)
- Convert annual crops to perennial
- Adapt more crops to exploit the nitrogen-fixing advantages of legumes
- Incorporate the biology of salt tolerance in more crops

Some specific data needs

- Weather
- Water availability, quality, and future water requirements
- Land cover and land use
- Biological performance of crops and livestock in varying environments

Improved modeling for priority setting and evaluation:

What is the ROI in research?

- Not possible to fund all opportunities
- Research benefits pay off in the future
- Models allow assessment of potential benefits versus costs
- Improved modeling now can make future investments more productive

2. LEAD EFFORTS TO PLACE CLIMATE CHANGE AND FOOD AND NUTRITION SECURITY AT THE CENTER OF INTERNATIONAL TRADE AGREEMENTS

Recommendations

- Include controls on export restrictions in international negotiations
  - Trans Pacific Partnership (TPP)
  - Transatlantic Trade and Investment Partnership (TTIP)
  - African Growth and Opportunity Act (AGOA)
- Incorporate climate change adaptation and resilience in the WTO work program on food security

Progress

- Crystal ball is fuzzy, but
  - TPP closer than TTIP
  - Congress and administration in discussions about fast track authority
  - AGOA up for reauthorization this summer
- Export ban regulation?

For additional information

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