Supporting Profitability with Climate-Smart Agriculture

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USDA’s 2015 Agricultural Outlook Forum
“Smart Agriculture in the 21st Century”
February 20, 2015
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

MIROC climate model, RCP 8.5

About 10°F
(Change in average maximum temperature, 2000 – 2050 °C)

GFDI climate model, RCP 8.5

About 4°F
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

Income and population growth will likely push prices up in the 21\textsuperscript{st} century (price increase (%), 2010 – 2050, Baseline economy and demography)

Climate change will push them up more
(price increase (%), 2010 – 2050, Baseline economy and demography)

CLIMATE CHANGE ALTERS GLOBAL CEREAL TRADE
Change in Net Exports of Cereals from Developed Countries (2010-2050, million mt)

With no climate change, exports would remain about the same.

With climate change, exports decline.
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

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