Climate Change and Crop Insurance in the United States

OECD-INEA-FAO Workshop on Agriculture and Adaptation to Climate Change

June 2010
Outline

- Overview of U.S. crop insurance program
- Historical loss experience
- Impacts of climate change on crop insurance
- Crop insurance and adaptation
Crop Insurance Program

- Federal Crop Insurance Corporation (FCIC)
  - Develops or approves insurance policies
  - Generates premium rates
    - Premium rates are subsidized
  - Provides operating subsidy to crop insurance companies
  - Provides reinsurance to companies

- Crop Insurance Companies
  - Market and service insurance policies
  - Adjusts losses
Types of Insurance

Liability by Type of Insurance

(Billion)


Other Group Revenue APH
2009 Total Liability All Crops

Liability
- Less than 1 Mill
- 1 Mill - 10 Mill
- 10 Mill - 40 Mill
- 40 Mill - 100 Mill
- 100 Mill - 400 Mill
- Over 400 Mill
Cause of Loss

- Drought 40%
- Excess Moisture 25%
- Hail 5-10%
- Hurricane 5%
- Excess Heat <5%
- All Other Causes 20%
Historical Loss Experience

Loss Ratio (Indemnity/Premium)
1980 to 2009

Loss Ratio

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Climate Change and Insurance

- Study of climate change and crop insurance
  - Research Triangle Institute (RTI)
  - Potential financial impact of climate change on crop insurance companies and FCIC
Overview of Model

- IPCC Climate Scenario A1B
  - Rapid economic growth and technological improvements
  - Balanced growth in energy use across alternative energy sources

- Global Circulation Models
  - GFDL-CM2.0 and GFDL-CM2.1 models developed by the Geophysical Fluid Dynamics Laboratory (GFDL), USA
  - Coupled Global Climate Model (CGCM) 3.1 developed by the Canadian Centre for Climate Modeling and Analysis, Canada
  - Meteorological Research Institute (MRI) coupled atmosphere-ocean General Circulation Model (CGCM) 2.2 developed by the Meteorological Research Institute, Japan Meteorological Agency, Japan
Overview of Model

- Environmental Policy Integrated Climate (EPIC) model
  - Uses GCM output to estimate crop yield effects
- Forest and Agricultural Sector Optimization Model (FASOM)
  - Assess market outcomes given yield effects
- Actuarial Model
  - Assess change in yield distributions
Overview of Model

Simulated Changes in the Yield Distribution of Corn in Woodbury County, IA under Climate Change Scenarios Considered
Impacts of Climate Change

Percentage Change in Dryland Corn Yields under the GCMs Simulated for the Longer-Term Using EPIC, 2045-2055
Impacts of Climate Change

Percentage Change in Dryland Soybean Yields under the GCMs Simulated for the Longer-Term Using EPIC, 2045-2055
Summary of Results

- Relatively small yield effects at a national level
  - Decreases in Central and South
  - Increases in North and West
  - Consistent with other studies
Summary of Results

- Overall small financial impacts for insurance companies at national level
  - Range: +3.1% to -1.2% around baseline
  - Readjustment of yield guarantees
  - FCIC Reinsurance

- Greater variability for FCIC
  - Range: +26.8% to -14.4% around baseline
Summary of Results

- Uncertainties
  - Variation across GCM’s
  - Mitigation effects
  - Catastrophic events not well captured

![Graph of Implied State-level Loss Ratios for Iowa](image1)

![Graph of Implied State-level Loss Ratios for Texas](image2)
Crop insurance and Adaptation

- **Premium rates**
  - Based on historical losses
  - Adapts to gradual changes in risk
    - Challenge: Non-linear/sudden changes
  - Revenue rates based on forward looking expectations of commodities markets
Crop insurance and Adaptation

• Incentives
  ◦ Premium rates can act as a price signal to grower about risk and the value of mitigation or adaptation
  ◦ Moral hazard – deductible, adaptive yield guarantee, loss adjustment process
    • Crop insurance designed such that grower is better off with a good crop than a bad one
    • Grower shares in substantial portion of risk
  ◦ Significant incentives to mitigate risk
Crop insurance and Adaptation

- Accommodate adaptive/mitigation responses by growers
- Revise program/policies to reflect evolving agronomic practices
Crop Insurance and Adaptation

- Location

Change in U.S. Corn Planted Acreage from 1979 to 2009

Change In Acreage
- **Increase**
  - 1 Dot = 5,000
  - Absolute Change

- **Decrease**
  - 1 Dot = 5,000
  - Absolute Change

Note: Includes only counties with estimates published for both 1979 and 2009.
Source: United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS)
Crop Insurance and Adaptation

- Biotech
  - “Biotech Endorsement” discount

![Graph showing the relationship between Biotech Yield and Conventional Yield with a 45-degree line and a curve indicating higher yields for Biotech crops compared to conventional crops.](image-url)
Crop Insurance and Adaptation

- Final planting dates
  - Revise to reflect changing agronomics

U.S. Soybeans Crop Insurance Final Planting Dates for 2010

Note: Reflects the latest final planting data across the types and practices insured in the county.
Source: United States Department of Agriculture (USDA) Risk Management Agency (RMA)
Crop Insurance and Adaptation

- Establishment of new practices for new areas/crops
  - Irrigation
  - Limited Irrigation
  - Skip Row
  - Organic

- Insurance offer: “Good Farming Practice”
Crop Insurance and Adaptation

- Effective crop insurance policies provide financial stability for growers
  - Frequently required by lenders
  - Financially stable growers more likely to invest in new growing practices to adapt to climate change