Motivation

• Adaptation to changing climate conditions
  • recently chosen strategies
  • not optimal future strategies
• Cultivation of biofuel crops
  partially to mitigate climate change
Biofuels and Climate Change

Year-to-Year % Change in Corn Acres, Price Level

<table>
<thead>
<tr>
<th>Year</th>
<th>% Change in Planted Acreage</th>
<th>Price - State Average ($/bu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2005</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2006</td>
<td>-3</td>
<td>1</td>
</tr>
<tr>
<td>2007</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2008</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2009</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Biofuels and Climate Change

Year-to-Year % Change in Acres

- Corn
- Sorghum
- Wheat
- CRP

Graph showing the year-to-year percent change in acres for corn, sorghum, wheat, and CRP from 2004 to 2009.
2006 Corn Acreage and Current Bio-Refineries in Operation or Under Construction

- Avg Price $2.98/bu.
- Avg county acreage lower than 2000-2009 mean.

Ratio: 2006 Corn Acreage to Mean Corn Acreage b/n 2000-2009
2007 Corn Acreage and Current Bio-Refineries in Operation or Under Construction

- Avg Price increased to $4.14/bu.
- Congress passed Energy Independence and Security Act of 2007, mandating increase in biofuel production.
- Dryland acreage increased 14%, irrigated acreage increased 19%.
Biofuels and Climate Change

Research Objective

Employ qualitative and quantitative analysis to understand farmers’
- decisions to cultivate biofuel crops
- responses to changing climate
Biofuels and Climate Change

Field-Level Analysis:
Land-use/land-cover data

Using satellite remote sensing, land use/land cover data to create a 250-m resolution annual dataset for KS

Christopher Brown
KU Geography

Stephen Egbert
KU Geography
Biofuels and Climate Change

Land-use/land-cover data

Finney County
Biofuels and Climate Change

Depicting temporal variation of land use/land cover across KS

Field-level change detection:
- crop rotations
- biofuel intensification
  e.g., increased frequency of corn cropping
- biofuel extensification
  e.g., conversion of non-corn cropland to corn
Administering three waves of surveys to KS farmers

- Wave 1 (N=2500): Feb 2011
- Wave 2 (N=450): Feb 2012
- Wave 3 (N=450): Feb 2013
- Document current, recent past
  - land uses
  - water usage (irrigation)
- Explore role of weather conditions
  - recent past
  - expected future

Jeffrey Peterson
K-State Ag Economics
Conducting multiple waves of interviews of KS Farmers

- Exploratory Interviews
  late spring 2010
- Main Waves
  - Wave 1 (N=216): spring 2011
  - Wave 2 (N=216): spring 2013
- Ethnographic Analysis
  - selected communities in 2012
  - extended residence
Biofuels and Climate Change

Water Use (Irrigation) Decisions
Impact of Land Uses on Water Quality

- Assess Costs of Biofuel Production
  - reduced water availability
    i.e., viability of aquifers
  - diminished ambient water quality
- Balanced cultivation
  - benefits (e.g., climate change mitigation)
  - costs