Managing the Economic Consequences of Future Droughts

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The literature suggests that production agriculture will have little problem adapting to future drought conditions. The most significant finding of this research is that in areas where pumping capacity is limited, irrigated agriculture may suffer as a result of future drought conditions.
Planning Today for Future Droughts

- The best way to mitigate the negative economic impacts of future drought is to maintain well capacity.

- This implies groundwater conservation today.
Governor’s Ogallala Aquifer Initiative #2

2. Support legislation to provide a process for proactive conservation plans (called Local Enhancement Management Plans, or LEMAs).

LEMA's are to be:
• Proactive
• Supported by the Groundwater Management District (GMD)
• Have corrective measures that address conservation needs
• May include mandatory water use reductions; and
• Approved by the Chief Engineer
LEMA vs. IGUCA

- LEMA’s are initiated by local producers
- LEMA’s are voluntary
- LEMA’s set their own rules
- LEMA’s are reversible
K-State Research and Extension

- Developed a new model to estimate the economic impacts of ‘Local Enhanced Management Areas’ on:
  - Producers
  - Rural economies
  - Ogallala aquifer
  - The value of conserved groundwater
  - The impacts of drought

- Modeling assumptions are based on local stakeholder inputs
Model Area:
Three High Priority Areas
Major Differences Between Subareas

- S.Q. Rainfall (17.9”, 21.2”, 18.6”)
- Starting Well Capacity
- Dryland Crop Mix

S.Q. Water Use Reduction (9.5%, 31.7%, 14.7%)

Non Uniform Hydrology (KGS Model)
  - Different rates of dryland conversion
  - Different rates of well capacity decline

Table 6. High Priority Subarea Assumed Future Dryland Crop Mix

<table>
<thead>
<tr>
<th>High Priority Subarea</th>
<th>Corn</th>
<th>Sorghum</th>
<th>Crop</th>
<th>Wheat</th>
<th>Fallow</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.2%</td>
<td>13.1%</td>
<td>28.3%</td>
<td>15.2%</td>
<td>39.4%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.0%</td>
<td>9.5%</td>
<td>20.4%</td>
<td>11.0%</td>
<td>56.2%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6.6%</td>
<td>20.6%</td>
<td>44.6%</td>
<td>23.9%</td>
<td>4.3%</td>
<td></td>
</tr>
</tbody>
</table>
Conventional Water Use Constraint

![Graph showing water use over time with impact of conservation policy]
Simulation Results Subarea 1
Well Capacity

[Graph showing the decline of well capacity over time for two scenarios: Drought Scenario and Drought Scenario with LEMA.]
Simulation Results
Simulation Results Subarea 1

Net Revenue

- Drought Scenario
- Drought Scenario with LEMA
Summary of Simulation Results

Table 35. Impacts of the GMD#3 Reallocation Scenarios Relative to the Status Quo Scenarios After Valuing the Conserved Groundwater.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Normal Weather</th>
<th>Drought Weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subarea 1: Cumulative Groundwater Use</td>
<td>-9.5%</td>
<td>-14.8%</td>
</tr>
<tr>
<td>Subarea 2: Cumulative Groundwater Use</td>
<td>-31.7%</td>
<td>-31.6%</td>
</tr>
<tr>
<td>Subarea 3: Cumulative Groundwater Use</td>
<td>-14.7%</td>
<td>-19.6%</td>
</tr>
<tr>
<td>Subarea 1: Cumulative Net Producer Revenue</td>
<td>3.9%</td>
<td>12.2%</td>
</tr>
<tr>
<td>Subarea 2: Cumulative Net Producer Revenue</td>
<td>-5.3%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Subarea 3: Cumulative Net Producer Revenue</td>
<td>-1.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Subarea 1: Cumulative Total Industry Output</td>
<td>5.7%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Subarea 2: Cumulative Total Industry Output</td>
<td>2.1%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Subarea 3: Cumulative Total Industry Output</td>
<td>0.5%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Subarea 1: Cumulative Value Added</td>
<td>4.7%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Subarea 2: Cumulative Value Added</td>
<td>-6.2%</td>
<td>-1.0%</td>
</tr>
<tr>
<td>Subarea 3: Cumulative Value Added</td>
<td>-3.0%</td>
<td>-3.9%</td>
</tr>
</tbody>
</table>
Conclusions

- Impacts of future drought condition can be mitigated by groundwater conservation today.
- Both producers and communities may experience positive impacts depending on:
  - The magnitude of reductions
  - Dryland options
  - Current hydrology
Questions