Background

➢ There is a lot of interest today regarding the relationship between corn and sorghum.

➢ Which crop is best for Kansas?

➢ Which crop will we be the predominant crop 50 years from now?
2. Support legislation to provide a process for proactive conservation plans (called Local Enhancement Management Plans, or LEMAs).

LEMAs 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
Background: K-State Research and Extension

- Developing new models to estimate the economic impacts of ‘Local Enhanced Management Areas’ on:
  - Producers
  - Irrigated crop mix
  - Rural economies
  - Ogallala aquifer
  - The value of conserved groundwater
  - The impacts of drought
Original Research Question

Given reduced groundwater supplies, 5 year allocations, and a continuous corn culture – what are the economic impacts of incorporating irrigated grain sorghum into the crop mix?
Kansas Crop Reporting Districts
Historical Annual Precipitation

Average Annual Precipitation
Kansas

The map of annual precipitation was created during the period 1921-1950. The data used were collected from the USDA Cooperative and USDA NRCS SNOTEL network, the other national and local networks. The GIS software used to create the maps is ArcInfo.

Information about the National Oceanic and Atmospheric Administration (NOAA) can be found at: http://www.woc.nos.noaa.gov/

The data set/4,116,994 digital data points created by the State of Kansas and obtained from the Kansas Climate Center can be found at: http://climate.kansas.edu/
Yield Exhibits Different Slopes

Yield Exhibits Decreasing Marginal Returns to Irrigation

Gross Returns Exhibits Decreasing Marginal Returns to Irrigation

There is a Risk Component to Yield

<table>
<thead>
<tr>
<th></th>
<th>Dryland Yield (bu/acre)</th>
<th>Irrigated Yield (bu/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Corn</td>
<td>Sorghum</td>
</tr>
<tr>
<td>Mean</td>
<td>126.9</td>
<td>104.5</td>
</tr>
<tr>
<td>Deviation</td>
<td>46.6</td>
<td>35.8</td>
</tr>
<tr>
<td>Upper limit</td>
<td>218.2</td>
<td>174.7</td>
</tr>
<tr>
<td>Lower limit</td>
<td>35.6</td>
<td>34.3</td>
</tr>
</tbody>
</table>

Courtesy of Dr. Kraig Roozeboom: Yield Functions: Performance Test Data; “A Study of the Efficiency of Corn & Sorghum Production in Kansas”
Normal Weather Profitability

Cumulative Distribution Function
Normal Weather

Gross Returns is gross revenue less variable expenses
Drought Weather Profitability

Cumulative Distribution Function
Drought Weather

Gross Returns is gross revenue less variable expenses
Normal Weather Profitability

Cumulative Distribution Function

- Non Irrigated Corn
- Non Irrigated Sorghum
Drought Weather Profitability

Cumulative Distribution Function

- Profit
- Probability

Non Irrigated Corn
Non Irrigated Sorghum
Averages do not tell the whole story

When you consider the variability in weather: incorporating grain sorghum into a crop mix can maintain revenues while reducing risk.
Historical Irrigated Crop Mix in Western Kansas Does Not Support My Conclusions

Source: NASS for western 3 crop reporting districts
Historical Irrigated Crop Mix in Western Kansas Does Not Support My Conclusions

- Source: NASS for western 3 crop reporting districts
Results From Last Year

- 2013 Sorghum School: Over 500 irrigated and nonirrigated corn and irrigate grain sorghum producers were in attendance and provided input.

- One conclusion: Crop Insurance is better for corn than for sorghum – insurance is structured to favor corn; Crop Ins. and price together skew gross returns.
Impacts From Last Year

- Working on a ‘limited irrigation’ insurance policy
  - Grain Sorghum Checkoff
  - Kansas Water Office
  - USDA RMA

- New farm bill has directed RMA to look at sorghum crop insurance products
Kansas Grain Sorghum Yield Trend
Kansas Farm Facts and KSU 2010 -2012 GS Performance Test Results
Historical Irrigated Crop Mix in Western Kansas
Crop Production function for 11” Rainfall Area

![Graph showing yield (bu) versus net irrigation (inches) for corn and sorghum.](image)
Irrigated T-Yields in Western Kansas

2013 Kansas Corn and Grain Sorghum Irrigated T-Yields
Corn on Top, Grain Sorghum on Bottom

Irrigated Corn T-Yield = 185% of Irrigated Sorghum T-Yield
Nonirrigated T-Yields in Western Kansas

Nonirrigated Corn T-Yield = 84% of Nonirrigated Sorghum T-Yield
Crop Production function for 21” Rainfall Area
Irrigated T-Yields in Central Kansas

2013 Kansas Corn and Grain Sorghum Irrigated T-Yields
Corn on Top, Grain Sorghum on Bottom

Irrigated Corn T-Yield = 165% of Irrigated Sorghum T-Yield
Historical Irrigated Crop Mix in Central Kansas

- **Corn**
- **Sorghum**
- **Soybeans**
- **Wheat**

Source: NASS for Central 3 crop reporting districts
Nonirrigated T-Yields in Central Kansas

Nonirrigated Corn T-Yield = 98% of Nonirrigated Sorghum T-Yield
Historical Nonirrigated Crop Mix in Central Kansas

Source: NASS for Central 3 crop reporting districts
Questions