Economics of Groundwater Conservation

West Central Kansas
Groundwater Management District #1

03/19/2013

ECONOMICS OF CONSERVE & EXTEND THE OGALLALA AQUIFER

- Multiple studies have been done, including by KSU researchers, Texas Tech & Texas A&M, and USDA specifically on this topic.

- Bill Golden & others at KSU did economic impact projections tied to groundwater models that projected farmers' future crop choices (based on the water left) and revenue.
  - We recommend develop an economic model tied to the GMD1's hydrologic model, to help refine your conservation program.

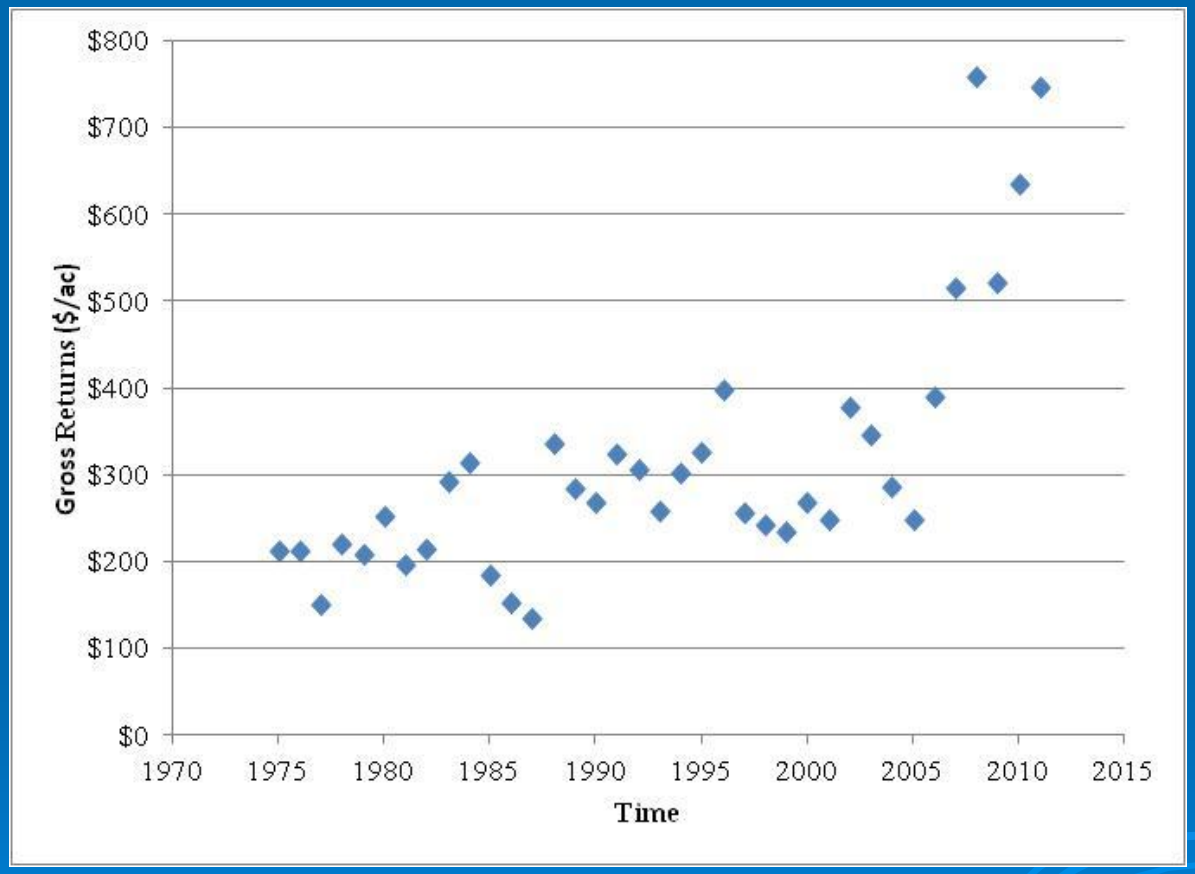
- KSU economists also studied a real life response in Wet Walnut IGUCA, in which the "junior" water rights were all reduced. (Junior was defined in this basin by when the water became over-appropriated).

Conclusions From Studies

- Some form of long term water use restriction is necessary in order to achieve any meaningful water savings.
- Adoption of improved biotechnology or more efficient irrigation systems without restrictions on water use will not save water.
- However using these strategies with a water use restriction policy can help negate the negative impacts to producer income and the regional economy.
- Water use reductions are preferable to acreage reductions.
- Flexibility in implementing water use reductions may reduce the economic impacts (Give producers greater ability to adjust.)

From "Economic Impacts of Selected Water Conservation Policies in the Ogallala Aquifer" available at http://www.agmanager.info/policy/water/default.asp

Value of Water Increasing
Average Returns with Irrigation



0.4% for1975-1999; 9.7% for 2000-2011; 3.5% for 1975 - 2011

Economic Model of GMD4

- Proposed goal: 30% reductions in priority area
- Modeled three ways to achieve

1. CREP scenario: USDA annual payments to producers in return for retiring water rights, and putting acres into grass for 15 years.

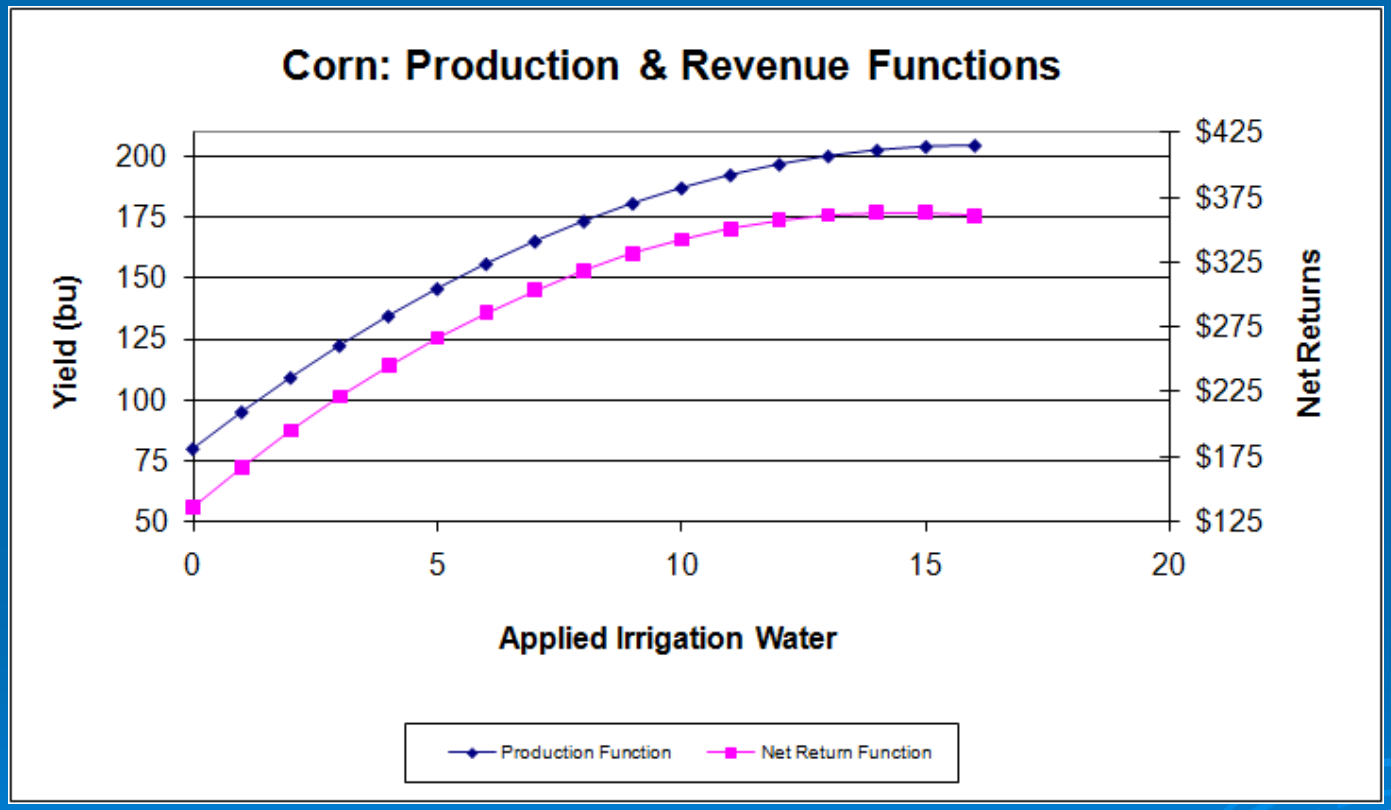
2. WaterTAP scenario: Smaller state payments to producers to retire water rights, but okay to farm.

3. No producer payments, but reduce irrigation water by 30% (limited irrigation)

Least regional economic impact: limited irrigation

The Producer's Decision

- Maximize Profits



More revenue is generated from the first inches than the last.

Example based on Southwest Kansas. Production functions are based on the KSU Crop Water Allocator, Revenue functions are based on the 2010 KSU Farm Management Guides

The Producer's Decision & Groundwater Policy

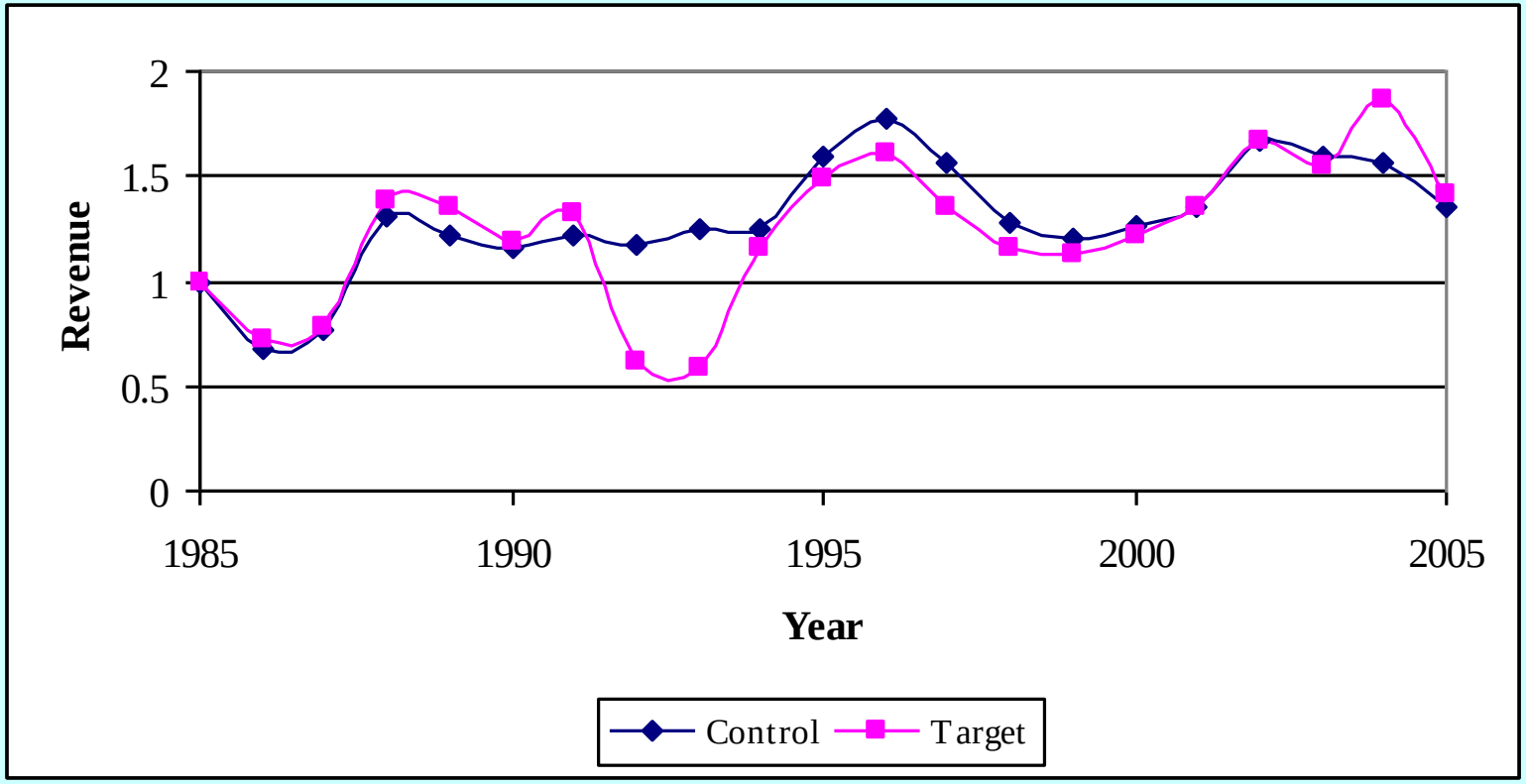
- Goal: Maximize Profit
  - Total Irrigated Expenses = $774 per acre
  - Fuel cost = $3.93 per acre-inch
  - Average Value of Water = $15.55 per inch
  - Value of first inch = $30.49
  - Value of last inch = $1.98
  - Profit Maximizing → 14 - 15 inches

Applied Water	Yield	Total Net Returns	Incremental Returns
0	80.0	$136.12	
1	95.1	$166.61	$30.49
2	109.3	$194.91	$28.30
3	122.5	$221.02	$26.11
4	134.7	$244.93	$23.91
5	145.9	$266.65	$21.72
6	156.2	$286.18	$19.53
7	165.4	$303.51	$17.33
8	173.8	$318.65	$15.14
9	181.1	$331.60	$12.95
10	187.4	$342.36	$10.75
11	192.8	$350.92	$8.56
12	197.2	$357.29	$6.37
13	200.6	$361.46	$4.18
14	203.0	$363.44	$1.98
15	204.5	$363.23	($0.21)
16	205.0	$360.83	($2.40)

- Policy Implications
  - It is more economically efficient to reduce groundwater consumption by reducing water-use per acre (reduce 1" on 15 acres) as opposed to reducing irrigated acres (reduce 15" on 1 acre) .

What will be the Impact on Regional Economies?
The Wet Walnut IGUCA

Figure 5. Time Series Comparison of the Indexed Values of Irrigated Crop Revenue



From "Impact Analysis of the Walnut Creek Intensive Groundwater Use Control Area" available at http://www.agmanager.info/policy/water/default.asp

Related Issues:

Needs for irrigators:

- Limited Irrigation Crop Insurance
- Appropriate sorghum crop insurance

Alternative Uses of Water:

- Per acre-foot of water-use in ethanol production, dairy, feedlots generates much higher Total Industry Output and Value Added compared to irrigated corn production*.

*From "The Impact of Ethanol in Western Kansas" available at http://www.agmanager.info/policy/energydefault.asp

Questions & Discussion