

Research & Extension Activities on the Economics of Groundwater Use

Briefing to the Deans of Engineering and Agriculture, February 2006

Compiled by J.M. Peterson, Agricultural Economics

1 Regional Impact and Policy Analysis

Economic Forecasts of Groundwater Use in the Ogallala Region

J. Peterson, J. Williams, Y. Ding, S. Amosson (TAMU), J. Johnson (TTU), L. Almas (WTAMU)

Funded by the USDA-ARS Ogallala Initiative

Economic optimization models were developed (Ding, 2005) to forecast water usage, net income, and aquifer changes over a 60-year planning horizon. Separate models and forecasts were generated for all counties in KS, CO, OK, NM, and TX overlying the Ogallala aquifer. Future work will use these models to compare the long-run impacts of various policy alternatives on the economy and the aquifer. This project relies in part on earlier work that evaluated the prediction performance of past optimization models (Peterson and Bernardo, 2003) and that identified the different motivations for conserving groundwater (Peterson, Marsh, and Williams, 2003).

Coupled Hydrologic-Economic Models

D. Steward, J. Peterson

Funded by the Water Resources Research Institute

An economic model of water-use decisions was coupled with a hydrologic model of aquifer changes based on data in Sheridan, County Kansas. The linked models were run in tandem over an 11-year period to quantify the hydrologic and economic impacts of changes in energy prices and crop prices (Peterson, Ding and Roe, 2003; Herrera-Rodriguez, 2004).

Valuation of Water Rights

K. Dhuyvetter, T. Kastens, B. Golden, J. Peterson

Funded by the Kansas Water Resources Research Institute

Interest has grown in public programs that reduce groundwater use by paying irrigators to retire (or temporarily inactivate) their right to use water. To evaluate such programs, both landowners and policy makers need information on the value of water rights—i.e., the minimum payment a landowner would need to forego irrigation. Golden (2004c; 2005) estimated the value of water rights in the Rattlesnake Creeks Sub-basin from land transaction data. This approach is being extended to other regions in western Kansas. Agricultural economics staff have also advised policy makers about the economics of such programs on several occasions (Dhuyvetter, Golden, and Kastens, 2003; Golden, 2004b, 2004c).

Economic Impacts of Irrigated Land Retirement

J. Leatherman, B. Golden, A. Featherstone

Funded by the Kansas Water Office

The Conservation Reserve Enhancement Program (CREP) is one of the particular programs being considered to reduce irrigated acreage. The purpose of this project is to evaluate the regional economic impacts of a proposed CREP program in the Arkansas River basin. Negative impacts would occur through reductions in the local demand for production inputs, such as fertilizer and irrigation equipment, and from reductions in the supply of crop output. On the other hand, retired land is likely to generate positive impacts from enhanced recreation opportunities such as hunting and fishing.

Effects of Technology Adoption on Water Use

J. Peterson, B. Golden

Funded by the Kansas Water Office

Although modern irrigation technologies have provided economic benefits to producers, their impact on net water usage is unclear. This study analyzes annual water-use report data from irrigators in Kansas to evaluate different technologies. Preliminary findings indicate that the average irrigator upgrading from a conventional center pivot system to a “center pivot with drop nozzle” system reduced water use by only a small amount or not at all, depending on the crop grown (Peterson and Golden, 2006).

Upper Arkansas River Basin Watershed Restoration and Protection Strategy

J. Leatherman, K. Mankin, B. Hargrove, D. Snethen, R. Wilson, C. Smith, B. Frisbie

Funded by Nonpoint Source Section, KDHE and the Kansas Water Plan

Work to begin this spring to develop a comprehensive watershed protection and management strategy in the Upper Arkansas River Basin. The multi-year initiative will entail organizing local stakeholder leadership teams, identifying threats to water quality, modeling land management alternatives and projecting impact to water quality, evaluating the cost effectiveness of land management alternatives, establishing land management/water quality goals, and development of a long-term implementation strategy to achieve goals and guide state and federal investments related to water quality. While this general model has been implemented in numerous watersheds across the state, it is expected to also consider water quantity concerns in the Upper Arkansas.

2 Farm Management

Crop Budgets

K. Dhuyvetter, T. Kastens, T. Dumler, A. Schlegel

Producers face an annual decision process in which they must select the crop to be grown and then choose how much irrigation water to apply. These decisions are heavily impacted from one year to the next due to evolving price and water-availability conditions. Crop cost-return budgets were developed in a spreadsheet format that can be tailored in individual farms (Dhuyvetter, Kastens, and Dumler, 2005). The tool also calculates the profit-maximizing fertilizer and water application levels based on user-entered prices (Kastens, et al., 2005).

Risk-Return Tradeoffs of Irrigation Scheduling Strategies and Crop Choices

J. Peterson, L. Stone, G. Clark, J. Williams

Funded by the USDA-CSREES Special Grant, “Water Conservation – Increased Efficiency in Usage”

An integrated field-level simulation model was assembled to predict corn and grain sorghum yields under alternative rainfall patterns and groundwater pumping capacities. The integrated simulator was created by linking existing models of crop growth (KWB, Stone et al., 1995), irrigation scheduling (KanSched, Clark and Rogers, 2000), and irrigation costs (IEES, Williams et al., 1996). The simulation outputs allow farmers to compare the levels of risk and expected income from different irrigation scheduling strategies (Fredrickson, 2004; Upendram and Peterson, 2006).

Irrigation Energy Options

K. Dhuyvetter, T. Dumler, T. Kastens, S. Funk, M. Langemeier, M. Wood, T. Zigler, J. Williams

Energy prices have increased dramatically in recent years and are expected to remain at historically high levels for the foreseeable future. These prices have a substantial impact on the costs of irrigation

and other farm inputs and will severely impact net farm incomes in the short run (Dhuyvetter et al., 2005; Williams, Nelson, and Langemeier, 2005; Williams, DeLano, and Aller, 2001). One way for irrigators to reduce energy costs is to switch their system to run on a different energy source (e.g., electricity instead of diesel). A spreadsheet tool was developed to compare the costs of these options (Dhuyvetter and Dumler, 2005). Extension meetings around the state are also being held this spring to educate producers on the impact of high fuel prices and how they effect crop decisions on irrigated land.

Nontraditional Crops

T. Dumler and S. Duncan

In the face of declining groundwater supplies, some producers are considering new crop alternatives to save water. Materials have been developed to help farmers evaluate the economics of crops such as cotton, which are not traditionally grown in Kansas but have lower water-use requirements than traditional crops (Dumler and Duncan, 2004).

3 References

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Futures-Based Price Forecasts for Anhydrous Ammonia and Diesel Fuel	Dhuyvetter	Updated monthly	Download

Production Publications:

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An Assessment of the State of the Agricultural Economy due to Increased Energy Prices	Dhuyvetter et al.	Nov, 2005	Download
An Assessment of the State of the Agricultural Economy due to Increased Energy Prices Associated with Hurricanes Katrina and Rita	Dhuyvetter et al.	Sept, 2005	Download
Estimating the Costs of Managed Haying or Grazing of CRP (MF-2657)	Taylor, Dhuyvetter, and Kastens	Sept, 2004	pdf Excel
Cotton in Kansas	Dumler, Duncan	Apr, 2004	Download
Economic Issues with Milling Hard White Wheat	Boland, Dhuyvetter	MF-2499 (2002)	Download
Characteristics of Profitable Farms: An Analysis of KFMA Enterprise Data (1999-2001)	Albright	Aug, 2002	Download
Differences between High, Medium, and Low Profit Producers for Kansas Crop Enterprises in 2000	Beaton, Dhuyvetter, and Albright	Mar, 2001	Download
Economic Issues with White Wheat	Boland, Howe	MF-2400	Download

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Economic Issues with White Wheat	Boland, Howe	MF-2400 (1999)	Download
No-till Handbook - Chapter 5: Yield and Economic Comparisons: University Trials	Dhuyvetter and Kastens	S-126 (1999)	Download
No-till Handbook - Chapter 6: Economic Benefits of No-till	Dhuyvetter and Kastens	S-126 (1999)	Download
No-till Handbook - Chapter 7: A Study of Economics Using Farm Management Data	Kastens and Dhuyvetter	S-126 (1999)	Download
Prices for Crop-Return Budgets	Kastens	MF-2226 (1996)	Download
Economics of Liming Kansas Cropland	Warmann	MF-2137 (1995)	Download
Impacts of Nitrogen Fertilizer on Irrigated Corn	Dhuyvetter, Schlegel	L-897 (1994)	Download

Production Economics:

Title	Spreadsheet	Author	Excel	Corresponding Paper	PDF
KSU-CRP HAYorGRAZE.xls	Tool to estimate the costs of managed haying or grazing of CRP acres	Taylor, Dhuyvetter, Kastens	Download	Extension bulletin discussing haying or grazing CRP acres	Download
KSU Irrigation Energy Cost	Tool to compare the irrigation pumping costs of various energy sources	Dhuyvetter, Dumler	Download		
Certified Seed	Tool to compare the returns of certified and farmer-saved seed	Boland, Dhuyvetter, Howe	Download	Extension bulletin discussing the economics of planting certified seed	Download

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