Story by Kathy Wythe

Ripple Effects

Water conservation policies, practices impact Ogallala region's economy

With water levels in the southern part of the Ogallala Aquifer—the major source of groundwater for the Southern Great Plains—declining, researchers across the Texas High Plains and Kansas are developing agricultural practices and technologies that use water more efficiently.

At the same time, a group of agricultural economists is determining the impacts water conservation policies and practices might have on producers' incomes and water savings, as well as the ripple effects on the regional economy.

Drs. Steve Amosson of Texas Cooperative Extension in Amarillo, Lal K. Almas of West Texas A&M University, Jeff Peterson of Kansas State University, and Jeff Johnson of Texas Tech University are principal investigators of the project. Part of the Ogallala Aquifer Initiative, a federally funded project through the USDA–Agricultural Research Service, the economics project began in 2003 and is scheduled to continue at least until 2008.

The economists have divided the southern Ogallala Aquifer region into three smaller regions based on similarities in cropping patterns and water availability. Texas Tech researchers are developing economic models in the southern part; West Texas A&M, the central part; and Kansas State, the northern part. These researchers have developed economic optimization models that project for a 60-year period water use, farm net income and aquifer-saturated thickness for each county in the study.

Almas, assistant professor of agricultural business and economics, said the optimization model determines the number of irrigated acres for each crop that maximizes the value of irrigation for each county, subject to water availability. The model also keeps track of changes in inputs, such as fertilizers and natural gas used to produce crops.

The economists are then able to project the use of water for a 60-year horizon based on the current irrigation technologies and water conservation management strategies, the current mix of crops for each county and the current amount of water pumped, Almas said.

"We have estimated in our region of 23 counties in the northern Texas Panhandle that, on average, 60 percent of the crop acres are under irrigation and 40 percent is dryland," he said. Projections from the optimization model indicate that after 60 years, only 12 percent of the crop acres will be irrigated because of lack of water.

In another portion of the economics project, Amosson and Extension Associate Bridget Guerrero take the results a step further. Using a socio-economic planning model, they first incorporate economic data for the counties in each sub-region and in particular crop production costs. Finally, they input the initial effects on farmers' incomes gained from the optimization models into the socio-economic modeling program. The results give an idea of what specific policies or technological advances will do to the

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overall economy and society in the region, including household incomes and employment levels.

The socio-economic planning model, called IMPLAN (Impact analysis for PLANning), is one of the most widely used socio-economic planning models in the country. To measure impacts, the model produces multipliers that estimate the total economic impact of a "shock" to an economy. These impacts are referred to as direct, indirect and induced effects. The model contains comprehensive and detailed data coverage of the entire United States by county.

What the economists have found is that certain strategies that save the most water may have negative impacts on producers' income.

Now, Amosson said, they are taking it a step further to see how what is happening with producers will affect the entire economy.

They are using the economic models to determine the effect of water conservation policies, such as USDA–Natural Resources Conservation Service's Conservation Reserve Program, which compensates farmers for converting farmlands to grasslands, may have on long-term water availability from the Ogallala Aquifer and the cost of water saved.

Amosson said policies or program changes, such as reducing irrigated acreage, can reverberate through the rural community. An example is "if you reduce the amount of irrigated acreage, you may not need to buy as much fertilizer," Amosson said. "If you don't buy as much fertilizer, you may not need as many fertilizer dealers. And, if you don't need fertilizer dealers, they move away, and if their kids are not going to school, you may lose a schoolteacher.

"Certain policies will have positive effects; some will have negative effects within the regional economy. Some will not have an effect at all."

Guerrero said they are currently surveying decision makers to determine the most important water conservation policies to analyze. From the survey, they will pick the top policies to run optimization and socio-economic modeling scenarios.

Amosson said the information gathered will provide scientific facts to decision makers and farmers so they understand the consequences of implementing policies or practices, and they can make informed decisions.

He said the modeling research will be able to tell them "if you implement this at this level, here are the impacts on the producer's income; here are what we are projecting are the impacts on the regional economy; here are the estimated water savings; here are the implementation costs. Then it is up to them."

Another objective of the economic research project is establishing a benchmark of currently used water-use practices and technologies, Guerrero said. This benchmark will enable the group to estimate more accurately current producer practices and irrigation technologies and get a more accurate picture of how changes in water management practices and technologies will affect the economy.

The ultimate goal of the economic project is "to minimize the drawing down of the aquifer and minimize the negative effects on the economy," Amosson said.

"We are trying to extend the useful life of the Ogallala Aquifer and make sure that water is available for future generations without compromising sustainability of rural communities," Almas said.