NSF Grant to Examine Attitudes toward Municipal Water Conservation Alternatives in the Face of Ethanol Production and Ogallala Water Scarcity

A team of researchers from North Carolina A&T State University, Angelo State University and Texas Tech University have received a National Science Foundation grant in the amount of $747,528 to study changing regional attitudes toward water scarcity as affected by ethanol production and increasing groundwater depletion of the Ogallala aquifer. This is an aquifer that covers some 174,000 square miles on the Great Plains, and extends across parts of 8 states.

Rising worldwide oil and gasoline prices have stimulated interest in ethanol production in an effort to supplement gasoline supplies and lessen the country's dependence on foreign oil. In response to the call for increased ethanol production, farmers last year planted more acreage in corn since the 1940's. The concern is that irrigation of biofuels crops and the production of ethanol both use large amounts of water. Since groundwater resource availability is already a critical issue with regard to the Ogallala, it will become an even greater issue in the Great Plains region of the country with increased biofuels crop production.

There are many studies that have evaluated water conservation on the Ogallala with regard to agricultural usage. These studies are highly valued in that they search for ways of implementing more efficient irrigation methods, developing crop types that are more resistant to water stress, crops that produce higher yields with the same or less water, etc. All of these studies are extremely important in trying to control the agricultural footprint (or stress) on the aquifer. And while the vast majority of groundwater usage comes from agriculture, municipalities on the Great Plains also depend on this resource for their everyday water needs. It has always been suspected, although not certain, that alternative sources would eventually have to be found for these communities. But, given the rise of the ethanol industry, and increased crop production to sustain it, the resulting accelerated withdrawal rate of the aquifer will increase the need for alternative sources in the very near future. In the meantime, however, while the search for more effective agricultural conservation moves forward, so will the conservation in municipal consumption to "buy time" in the search for alternative sources. This is where our project fits in.

This collaborative study will employ innovative methods to investigate the dynamics of the societal responses to declining water availability in the region overlying the Ogallala aquifer. It will also measure the attitudes toward market and regulatory approaches in allocating this increasingly scarce resource in this part of the country. The plan is to survey approximately 30 municipalities across the Ogallala region, gauging their attitudes toward two conservation measures--regulatory constraints versus price rationing in light of the increased ethanol production in the region.

Across the U.S., perhaps the most common conservation method employed relies on regulatory conservation measures that either limits the amount of water a person and/or business can use, and implements fines when water is wasted--all this while having pricing schemes that encourage use by either keeping the price of water constant regardless of the amount used, or actually letting it decline as more water is used. The field of economics dictates that this is inefficient at best. The regulation of water use is easily ignored by many, requires costly oversight as the community officials must watch

for those who try to circumvent the regulation, it increases judicial backlog as the number of citations increases, and generates animosity within a community as those who follow the rules grow impatient with their neighbors who do not. It also does not promote conservation from those who are "exempt," so to speak. For example, those who do not own cars obviously are not restricted from car washing restrictions, or those who rent apartments are not subjected to a ban on lawn watering.

However, we can assume that most people use more water than what is needed for basic health and hygiene, especially during certain times of the year. The amount used above that "basic need" can be priced at a higher rate, in hopes of reducing the quantity of water demanded. It is like any commodity--at high prices we use less of it, at low prices we tend to use more of it. Using price as a rationing tool in this fashion eliminates oversight as long as the resource is metered. It eliminates the need for citations, and everyone pays something, but those who use more, pay more, and vice-versa.

In certain areas, it is thought to be politically incorrect to ask people to pay more for something they view as a vital, life-sustaining, natural resource. Conversely, if a community's water resources are in short supply, it is our belief that if the situation is prefaced to consumers correctly as to the seriousness of the situation, most people will understand and accept the reason for the increase in price. A previous study done by two of the researchers participating in this project found that at the very least, people are indifferent to using pricing as a rationing tool, and can actually be more hostile to regulatory conservation measures. This somewhat negative attitude toward regulatory measures leads these researchers to believe that not all communities will be completely hostile to price rationing; which means that at the least, a hybrid policy of regulatory and pricing measures, if implemented, would be more efficient than pure regulatory measures. At best, a community would adopt only a price rationing mechanism. A municipal water conservation policy such as this will hopefully result in increased sustainability of the resource, lower costs, and increase revenues for the community to seek future alternative water resources, improvement of roads, schools, etc.

The end result of the study is to use the survey data to generate a model whereby communities can input their particular demographics and the community's interconnection to agriculture and the ethanol industry. The model will generate suggestions as to what type of policy would be most favorable, and therefore allow for greater efficiency in addressing the inevitable water conservation policy that the community is seeking.

The researchers involved in this project are a multi-disciplinary team including Drs. Jeffrey A. Edwards and Lyubov Kurkalova from North Carolina A&T State University, Dr. R. Gary Pumphrey from Angelo State University, and Ms. Lucia Barbato and Colleen Barry-Goodman from Texas Tech University.

Dr. Edwards is an economist, and is the Principal Investigator (PI) on the project; his role will be to coordinate all aspects of the study. He will also be the primary data manager and empirical modeler and will be intimately involved in the publication process.

Dr. Kurkalova, Co-PI, is an agricultural economist, and an expert in the ethanol field. She will work with crop prediction models and will develop region specific, ethanol production related clustering of the survey data, as well as refinement, estimation and

interpretation of the empirical model explaining the choices of water conservation measures.

Dr. Pumphrey, Co-PI, is a geographer, and will be involved in setting up the survey grid, supervision of the survey process, management of the relevant data concerning the aquifer and groundwater law in each state, and will be the liaison for communities that overly the aquifer and will monitor their municipal water policies.

Dr. Edwards, and Dr. Pumphrey will also attend regional and national conferences to report on the progress of the project, as well as disseminate results of the project.

Lucia Barbato, Co-PI, is an expert in the field of Geographic Information Systems (GIS) and associate director for the Texas Tech University Center for Geospatial Technology (CGST). She will develop the survey grid and maps using GIS techniques. The CGST will develop a website to disseminate information generated from the study including maps depicting the locations of ethanol refineries, municipalities participating in the population survey, data generated from the survey, methodology and results.

Colleen Barry-Goodman is director of the Earl Survey Research Laboratory in the Department of Political Sciences at Texas Tech University. The Lab's responsibility will be to coordinate and execute the implementation of the population survey based on the municipalities selected from the survey grid, and disseminate that information to the Co-PIs.