Rio Grande Basin Initiative

OUTCOMES

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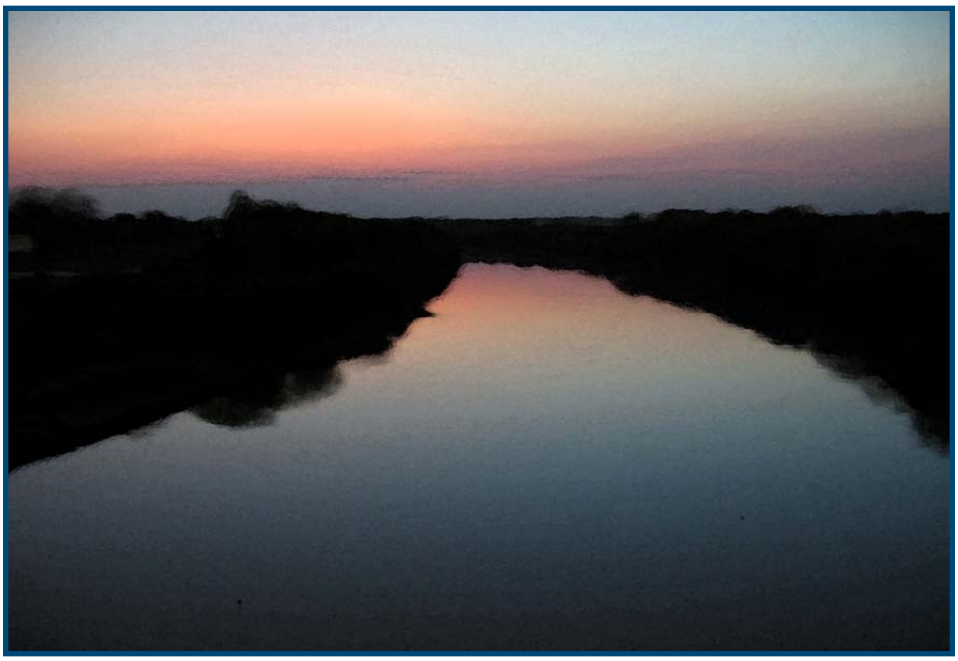

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Texas A&M Agriculture
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RGBI Researchers Spend Time in Prison

Graywater versus well water study in El Paso

by
Danielle Supercinski

Naomi Assadian and other researchers have been going to Rogelio Sanchez State Prison in El Paso, Texas, not serving time, but spending time exploring the potential for safe and beneficial uses of graywater for irrigation.

"We have been interested in wastewater reclamation to conserve fresh water supplies and realized little work had been done with graywater in far West Texas," said Naomi Assadian, associate research scientist at the El Paso Agricultural Research and Extension Center. "We also wanted to do something at the state prison because a prison crew helps us at the Research Center. One crew is assigned to work at our Research Center three-quarters time and they assist and get trained in maintenance projects. A different crew maintains our research plots located at the prison."

Assadian decided to use the prison grounds to construct a field test and study how graywater irrigation affects crop yields versus using salty groundwater. The prison provided a non-traditional site on a desert mesa of shallow, loamy sand underlain by caliche, receiving less than 10 inches of rain during the growing season. Graywater, diluted wastewater coming from showers, kitchens and laundry, comprises 68 percent of total domestic wastewater. At the prison, 11 loads of laundry are washed per day going through two wash cycles, two rinse cycles and one sour bath/bleach cycle, using 3,500 gallons of water daily.

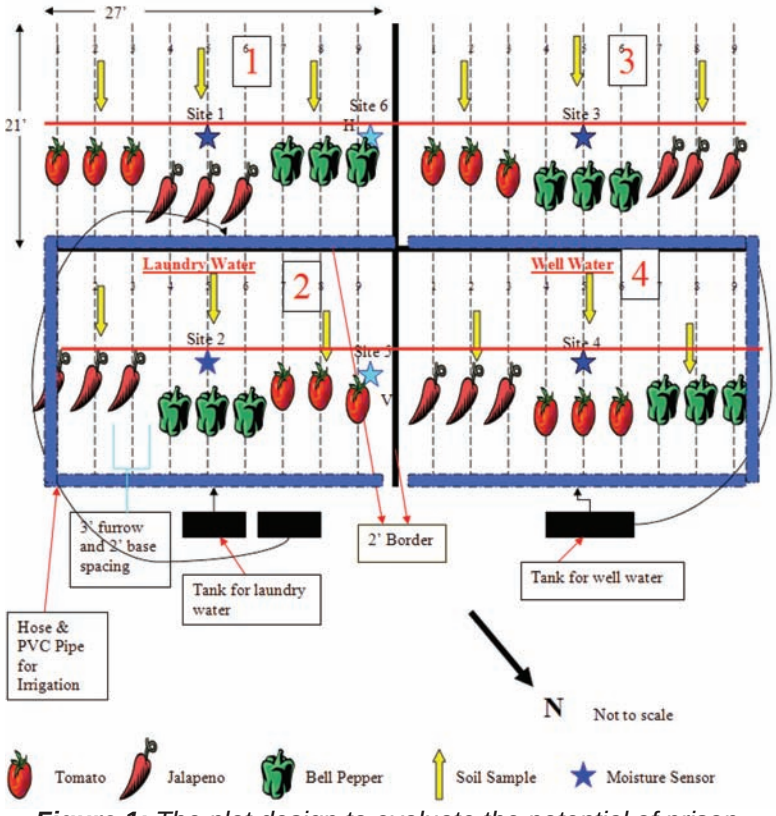

Figure 1: *The plot design to evaluate the potential of prison laundry water as an irrigation supply at Rogelio Sanchez Prison, El Paso, Texas.*

"Using laundry water was an excellent choice because in most households and in the prison, laundry consumes vast amounts of water," Assadian said.

The prison's only source of landscape irrigation up to this point was salty groundwater. The researchers decided that reusing the laundry wastewater provided an alternative to using potable water or the salty groundwater.

Prior to planting, two moisture sensors were placed 5 and 8 inches below the soil surface and connected to above-ground data loggers. Vegetable seedlings were purchased from a local nursery and transplanted to the plots on May 3, 2005. Tomatoes, long green chilies and bell peppers were the vegetables chosen for this study because they are very susceptible to salinity.

"If we could grow high maintenance veggies with poor water, we knew we could grow almost any crop," Assadian said. "We also wanted to verify that pathogen contamination may be little to none under a hot and dry desert environment in spite of potential waterborne pathogens."

Bell pepper mortality was highest, suggesting more sensitivity to environmental change and salinity than tomatoes or long green chilies.

Tomatoes, green chilies and bell peppers are grown in this demonstration plot at the prison. Four sets of each plant receive graywater and another four sets of each plant receives salty groundwater.

"Hot temperatures in May followed by a cool, moist winter and spring flushed leaf hopper populations from the fringe of the desert onto the plots," Assadian said. "Leaf hoppers were vectors that transmitted curly leaf virus to the vegetable plants. About 30 percent of all plants were infected with the virus by June 10, 2005."

Evidence of infection increased and affected overall plot production, she said. Insecticide application alone did not control the transmission of disease. However, in spite of the infection, all vegetables grew well in all plots.

The most challenging issue was establishing a water delivery system to the demonstration plots, Assadian said.

"Security prevented construction of a continuous pipe system from the laundry trap inside the prison to the field test site outside of the prison," she said. "As a consequence, water was pumped and transferred from a mobile reservoir to a stationary one. The 250-gallon capacity of the stationary water tanks and the tedious pumping process dictated irrigation volumes for each application."

Shallow, salty groundwater was pumped from a well, hauled and placed in a 900-gallon stationary tank. Water delivery from the tanks to the blocks was via a 2-inch diameter PVC pipe using gravitational flow. The PVC delivery pipe was connected to a perforated PVC pipe laid perpendicular to the nine rows in each plot, so that water was distributed uniformly to each furrow (see Figure 1).

The plots were irrigated every two to three days, and soil moisture was measured by the moisture sensors. Salinity, soil moisture, *E. coli* and vegetable data were collected regularly. *E. coli* was not found in laundry water collected directly from the subsurface laundry water trap. Both the laundry water and well water were tested for salinity, and the laundry water was less saline than the well water. Soil moisture data was collected for each plot at time intervals from 1 minute to 15 minutes and this data was downloaded every other week.

Researchers originally thought that salty well water may be a superior irrigation source to laundry water. Instead, laundry water irrigation significantly increased vegetable production relative to well water irrigation.

Preliminary results suggest that the reuse of laundry water for irrigation may be beneficial and safe even for salt sensitive crops like vegetables, she said. Vegetable data results suggest laundry water had no detrimental affect on early transplant stress and plant growth. Irrigation with laundry water actually increased fruit yields, fruit size and the number of fruits harvested from selected plants relative to those receiving well water irrigation, Assadian said. Average yields from the three plants irrigated with laundry water were almost four times greater than those from well water plots. Tomatoes produced the highest yields, followed by bell peppers and long green chilies.

"Our field observations indicate that long green chilies and bell peppers were more salt sensitive than tomatoes," Assadian said. "Salts decreased long green chili pods to the size of jalapeno peppers."

*See **Prison** on page 5*

Precision Irrigators Network

Helping growers conserve water and schedule irrigations

by
Danielle Supercinski

Growers are becoming more involved with on-farm irrigation research to conserve water through the Precision Irrigators Network (PIN) project, funded by the Texas Water Development Board, which came from a natural progression of the Rio Grande Basin Initiative (RGBI).

"RGBI provided the lab to develop the knowledge we have of crop-water use," said Dr. Giovanni Piccinni, assistant professor of crop physiology with the Texas Agricultural Experiment Station. "Lysimeters at the Uvalde Agricultural Research and Extension Center allow us to provide growers in the region with precise data of crop-water use. The Uvalde Center currently has five lysimeters installed, with two more to come sponsored by the Wintergarden Groundwater Conservation District."

In addition, RGBI provides precise research data that must be done on the research station farm so if losses occur they can be corrected. PIN then takes this research to the growers to calibrate it further for the Edwards region. Researchers want growers to implement an irrigation schedule based on precise meteorological data from nearby weather stations, providing estimates of evapotranspiration (ET) and crop coefficients developed using lysimeters.

"We know how to manage full irrigation, unfortunately full irrigation is often not an option."

"PIN provides a support system for irrigation management," Piccinni said. "Irrigation needs to be calibrated to different soils, cropping systems and the environment. We're trying to do this with the collaboration of the growers so they can see how it works on each farm."

When a grower begins participating in PIN, researchers visit with the growers, go on-farm and look at the field, and try to collect data off the field – crop rotation, irrigation schedules, type of irrigation, planting date, plant growth, soil type, etc. Watermark sensors are installed to monitor soil moisture. This data is inputted into a computer model and researchers explain the information they have found to the growers.

"These irrigation scheduling data are then compared with the grower's experience and knowledge of the field," Piccinni said. "Then we compare his irrigation schedule with what the potential ET calculator is telling us, what the soil moisture sensor is telling us and what the grower experience is telling us. This way, everyone is participating in the research process."

"We want to give as much water as the crop needs and not a drop more because we want to make every drop count!"

Once the growers buy into this process and the new irrigation strategies, it is more likely their neighbor can see what's going on and buy into it as well. Piccinni is trying to get away from grower's skepticism of these irrigation practices working at the research center plots, but not in the field.

"PIN has allowed us to get away from small replicated research plots and do large scale research with different treatments imposed by the landscape variability that exists throughout the Edwards region," he said.

The ultimate PIN goal is for growers to gain more knowledge on how to schedule irrigations and how to manage limited irrigation.

"We know how to manage full irrigation, unfortunately, given water restrictions in this region, full irrigation is often not an option," Piccinni said.

The PIN project currently consists of 15 growers throughout Atascosa, Bexar, Frio, Medina, Uvalde and Zavala counties. Researchers work with the PIN growers to help schedule limited irrigation by using decision support systems such as the potential ET networks and CroPMan computer models.

Growers, county Extension agents and researchers all collaborate and work together on this project to implement efficient irrigation management. Extension agents identify growers to participate in PIN, and

(Left) Growers learn about the PIN during the National Spinach Conference Field Day tour. (Right) Eddie Byrom, Giovanni Piccinni and Brad Ensterling in a center pivot-irrigated corn field installing watermark sensors to monitor soil moisture.

they hold meetings to explain how PIN works to the growers.

Kenneth White, ag and natural resources county Extension agent in Uvalde County, is one of these county agents who began implementing PIN in the fall of 2004 by taking ET information out to a few grower's fields.

"The first cooperator I used the data logger and sensors with kept track of fuel costs and irrigations," White said. "He reported they were able to save more than 4 inches of irrigations, or 50 acre-feet of water, and fuel costs of $20 per acre. They used this information on their bermudagrass pastures and winter pastures."

He currently works with 11 growers on corn, cotton, bermadagrass and cool season forages. Watermark sensors and data loggers are established in all fields, and result demonstrations on drip irrigated onions, spinach, cantaloupes and warm season grasses are established.

"As a result of implementing the PIN and weather stations, growers and consultants will be able to use local ET Web sites, newspapers and radios to assist with their irrigation scheduling," White said.

Bill Howell, producer at the Chaparrosa Ranch west of La Pryor, said: "Utilizing the information from the weather station takes 85 to 90 percent of the guess work out of how much water to apply in their forage operation. I can use that information along with information from the watermark sensors to determine when I need to irrigate our forages."

Austin Clary, a cotton producer in Sabinal, called White asking if he was still planning on establishing result demonstrations on using soil moisture sensors and data loggers. Clary said this was the best and most informative information he has ever used to assist him with his irrigation scheduling.

"We want to give as much water as the crop needs and not a drop more because we want to make every drop count," Piccinni said.

Prison

continued from page 3

"We are now entering year two of a three year project, and we are hoping to gather more data on potential salt accumulation in the soil, the persistence of *E. coli* in soil and on mature fruits, and the yield performance of relatively salt sensitive crops," Assadian said. "RGBI contributes to this project in a tremendous way. I use RGBI support for labor, chemical analysis and supplies. Without RGBI funds, this project would be reduced to a show and tell project without any data."

Additional funds for this project are received from the U.S. Bureau of Reclamation (BOR). Collaborators are Woody Irving with BOR and Sergeant Gibson, Officer Barnes and offenders at Rogelio Sanchez State Prison. Critical support is also provided by co-PI Dr. Zhuping Sheng, Dr. Wesley Brown, Joshua Villalobos and Elizabeth Gonzalez from the Texas A&M El Paso Research Center.

"Water reclamation is not an easy task and often is more challenging than using good water supplies," Assadian said. "However, this project demonstrates that a multiple-agency, multiple-team effort can successfully work toward a common, but challenging goal to beneficially use every drop of precious water."

Communicating Outcomes

Annual collaborating and sharing of information

by
Danielle Supercinski

(L to R) Allan Jones, TWRI director; Ari Michelsen, TAMU; Kevin Urbanczyk, TSUS; Vic Morgan, Sul Ross President; Bill Harris, TWRI; and Daene McKinney, UT-Austin.

As participants arrived in beautiful Ruidoso, New Mexico, cool, breezy weather greeted them for the fifth annual Rio Grande Basin Initiatives (RGBI) Conference held March 28-30, 2006.

The week began with welcome talks from project and university administrators and an overview of New Mexico region water issues. The first day moved quickly into individual task group and county program presentations, which continued throughout most of the conference. The week ended with additional project reports from the U.S. Geological Survey, New Mexico Water Resources Research Institute and an overview of the River Systems Institute, Transboundary Studies Center and Edwards Aquifer Center at Texas State University. The conference closed with wrap-up discussions regarding future collaborations.

RGBI project participants from New Mexico State University (NMSU) and the Texas A&M University System (TAMUS) attended along with participants from two other Rio Grande projects from the Texas State University System (TSUS) and the University of Texas (UT). This three-day event brought together project administrators, state and federal agency partners, irrigation district managers, Extension agents and specialists, and Experiment Station researchers.

"We have a lot of friends in this room and we enjoy the opportunity to get together, meet and discuss our research and educational efforts and results," said Dr. Bill Harris, RGBI project director and associate director of Texas Water Resources Institute. "It is a great pleasure to collaborate with NMSU in our RGBI project and we enjoy our newer interactions and collaboration with Kevin Urbanczyk from TSUS and Daene McKinney from UT."

Having this joint conference between the three initiatives allows project participants from the different universities to visit with each other and discuss opportunities for collaboration on their projects in the future, Harris said. The format for this year's conference was set-up different than previously to allow each of the three projects time to talk and present each individual's project efforts and results.

"Most of the time project participants within the same project aren't aware of each other's efforts," Harris said. "This format gave everyone a chance to see what everyone else is doing within their own initiative."

The RGBI project is in its fifth year and success continually builds toward conserving water in the Rio Grande Basin.

"You might think that the enthusiasm and excitement might be diminishing, but I don't see that," said Craig Runyan, water quality and RGBI program coordinator at NMSU. "It's a synergy that builds upon itself. As long as we're showing enthusiasm and getting results then we help to ensure we continue with these activities."

However, it is apparent that collaboration is the key.

"It is important for TAMUS, NMSU, UT and TSUS to know what each other is doing," said Kevin Urbanczyk, project director for the Sustainable Agricultural Water Conservation Project and Earth and Physical Sciences Department chair at Sul Ross State University. "This is a perfect example of collaboration. I plan on attending all of these meetings in the years to come."

To view the 2006 and past conference materials, presentations, photos and all initiatives' Web sites go to http://riogrande-conference.tamu.edu.

County Program Highlights
Uvalde County

Kenneth White
Uvalde County
Agriculture and Natural Resources Extension Agent

Programs: Extensive programs and result demonstrations in field crops, vegetables and forages. Other programs involve livestock and wildlife. Work with the Precision Irrigators Network producers monitoring soil moisture and collecting information from data loggers.

Crops: Corn, cotton, grain sorghum and wheat

2005 Accomplishments: As a result of irrigation work, the Precision Irrigators Network (PIN) was developed and implemented in 2005 and has expanded to six additional counties. Producers have been able to reduce pumping costs and conserve water by utilizing soil moisture sensors, data loggers and weather station data to schedule irrigations. County crop tours have been conducted with more than 100 participants to view the latest information on water conservation and irrigation management.

Kenneth White said: "One of the most enjoyable things in my 32 year career as an Extension Agent has been the opportunity to work with producers in implementing new or different ways of doing things."

Faces of RGBI
Web site guru provides technical support

by
Bill Harris

When anyone at TWRI needs a project Web site developed, changed or edited, they head straight to Jaclyn Tech's office. She joined TWRI in 2003, and she now manages more than 20 project Web sites, including the RGBI Web site, and works for both TWRI and the Spatial Sciences Lab.

Jaclyn is always more than happy to add new stories to the homepage, add a couple more pictures, make a few changes here and there, and whatever else is asked. She has done a wonderful job maintaining the RGBI Web site, as well as developing the joint Rio Grande Basin Initiatives Conference Web site in such an efficient and speedy fashion.

As a member of the TWRI-RGBI team, Jaclyn attended the conference in Ruidoso, NM and provided excellent support with setting up Power Point presentations so they would flow seamlessly. From re-linking all the presentations to the presenters' names to making updates to presentations and copying new presentations from jump drives to the computer at the last minute, Jaclyn kept it all under control and flowing smoothly. She is also creator/webmaster of the joint three initiatives' conference wrap-up CD and Web site.

We really appreciate Jaclyn's technical support that she provides the RGBI as well as all the other projects she works on. Thank you, Jaclyn! Your cheerful face brightens our days.

Increasing Irrigation Efficiency in the Rio Grande Basin through Research and Education

Through Extension and research efforts, the Texas Agricultural Experiment Station and Texas Cooperative Extension and counterparts at New Mexico State University are implementing strategies for meeting present and future water demands in the Rio Grande Basin. These strategies expand the efficient use of available water and create new water supplies. This federally funded initiative is administered by the Texas Water Resources Institute and the New Mexico State University Water Task Force with funds from the Cooperative State Research, Education and Extension Service.

Rio Grande Basin Initiative Outcomes
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