

**Quarterly Progress Report
Texas Water Development Board Contract
2004-358-005**

Quarter No. 2 from 3-15-05 through 6-15-05

Overview

In January 2005, the Texas Water Resources Institute (TWRI), in conjunction with the Texas Water Development Board (TWDB), administered a request for proposals. At that time, eight projects were awarded funds (studies 1 through 8 shown in Section B). In February 2005, TWRI and TWDB awarded funds to two additional projects (studies 9 and 10 listed in Section B).

TWRI continues to interact with project leaders on a regular basis and offers support to these teams on an as-needed basis.

TWRI is now in the process of posting the proposals for each of these projects on the Institute's Web site. In addition, TWRI will post quarterly reports describing these projects on the Institute's Web site in the near future.

Listing of Funded Projects

1. James Bordovsky, Texas Agricultural Experiment Station at Plainview. "Equipment Installation for the Evaluation of Crop Row Direction and Offset Distance from Subsurface Drip Irrigation." \$10,000.
2. John Jifon, Texas Agricultural Experiment Station at Weslaco. "On-Farm Volumetric Measurement of Irrigation Water Use as a Best Management Practice Tool for Water Conservation in Drip Irrigated Vegetables." \$10,000.
3. Allen Knutson, Texas Agricultural Experiment Station at Dallas. "Implementing Biological Control of Saltcedar in the Upper Colorado River Watershed." \$9,577.
4. Leonardo Lombardini, Texas A&M University Horticulture Science Department. "Irrigation Scheduling in Pecan Orchards Using a Soil Water Balance Model." \$9,732.
5. G.J. Michels, Texas Agricultural Experiment Station at Bushland. "Biological Control of Saltcedar at Lake Meredith, Texas." \$6,776.
6. Genhua Niu, Texas Agricultural Experiment Station at El Paso. "Determining Plant Water Use and Crop Coefficients of Selected Nursery and Landscape Plants." \$9,425.

7. Genhua Niu, Texas Agricultural Experiment Station at El Paso. "Impacts of Drought on Salinity Tolerance of Landscape Woody Plants Irrigated with Reclaimed Wastewater." \$9,425.

8. Bobby Stewart, West Texas A&M University. "Seeding Dryland Grain Sorghum in Clumps to Decrease Tillering and Increase Grain Yield." \$9,500.

9. Giovanni Piccinni, Texas Agricultural Experiment Station. "On-Farm Research to Evaluate Irrigation Scheduling Tools to Increase Yield and Control Diseases." \$10,000.

10. John Sij, Texas Agricultural Experiment Station at Vernon. "Managing Water Resources of the Seymour Aquifer Using Subsurface Drip Irrigation." \$10,565.

Progress/Activities

1. James Bordovsky, Texas Agricultural Experiment Station at Plainview. "Equipment Installation for the Evaluation of Crop Row Direction and Offset Distance from Subsurface Drip Irrigation."

Overview

The overall goal of this project is to quantify the extent to which the physical distance between subsurface drip irrigation systems and the rows in which crops are grown may affect cotton germination, nutrient uptake, and crop yield, as well as water use efficiency.

Activities Conducted This Quarter

A well that will supply water to subsurface drip irrigation plots at Halfway, Texas, has been developed and tested. The plot where subsurface drip irrigation lines will be installed was mapped and surveyed using global positioning system (GPS) software. With this data, a geographic information system of the field was created that shows the location of the drip lines. GPS data were also used to automatically steer the tractor that is installing the subsurface drip system. As of the end of June, half the drip irrigation laterals had been installed.

Activities Planned for the Next Quarter

Additional work that needs to be completed includes installing the remaining subsurface drip irrigation laterals, water supply manifolds, and flush lines; constructing a filter station and controllers for each zone; and a pump and motor. The pump and motor will provide an independent water supply for tests of the subsurface drip irrigation system.

Progress on Spending Funds

Roughly \$2,150 had been spent by June 6, 2005.



Installation of the drip irrigation system at Halfway.

2. *John Jifon, Texas Agricultural Experiment Station at Weslaco. "On-Farm Volumetric Measurement of Irrigation Water Use as a Best Management Practice Tool for Water Conservation in Drip Irrigated Vegetables."*

Overview

The overall objective of this study is to determine if affordable water meters can be used to accurately measure the amount of water used for irrigation and to calculate water use efficiency. By establishing such a methodology, comparisons can be made about the volume of water use as well as the amount of water that can be saved from the use of drip versus furrow irrigation systems.

Activities Conducted This Quarter

During the spring of 2005, studies were begun in commercial-scale fields where onions were irrigated in Starr and Hidalgo Counties. Portable water meters were used to measure how much water was supplied to plots throughout the growing season. This information was combined with crop yield data to calculate crop water use efficiencies (i.e., the amount of crop yield grown with a set volume of water). Currently, two types of water meters are being calibrated and a set-up to remotely acquire data is being designed.

Preliminary results from this study show that this technology can be used to compare the water use and efficiency of different irrigation systems. This study shows that drip irrigation used 46% less water than furrow irrigation, and more than doubled onion yields.

Activities Planned for the Next Quarter

The studies will continue and will be replicated on additional fields later this summer. The plan is to eventually carry out similar experiments in commercial fields.

Progress on Spending Funds

Funds were used to purchase soil moisture sensors, data loggers, and prototype water meters with pulse generators for remote monitoring and data collection. \$4,000 has been spent to-date.



Juan Enciso, John Jifon, and Xavier Peries view this drip system used to grow onions.

3. Allen Knutson, Texas Agricultural Experiment Station at Dallas. "Implementing Biological Control of Saltcedar in the Upper Colorado River Watershed."

Overview

The overall goal of this project is to establish nursery sites for rearing large numbers of a specific species of beetle that can be used to biologically control water wasting saltcedar in the Upper Colorado River watershed. These studies are concentrated along Beals Creek near Big Spring, Texas.

Activities Conducted This Quarter

Beetles were established in screened cages at sites in the Upper Colorado River watershed, and 24 sites along two tributaries of the river were identified and marked where the beetles can be released into the field. Beetles were also established in field cages at Fort Stockton that may be released into the Pecos River watershed. The Pecos Basin studies are being developed with Texas Cooperative Extension specialists Charles Hart and Mark Muegge. In March 2005, adult beetles were observed in the field on saltcedar trees, confirming that this species can overwinter in the region. By examining conditions in the field, the research team estimates there are 3,500 beetles and larvae in the Upper Colorado watershed. The beetle population is slowly spreading to nearby areas.

Information about this project was presented to the Texas and New Mexico Saltcedar Biological Control Consortium in El Paso in March 2005. In June, presentations were given to the board of the Big Country Soil and Water Conservation District and to a saltcedar management workshop sponsored by the Texas State Soil and Water Conservation Board.

Activities Planned for the Next Quarter

Beetles now being propagated will be placed in cages at the 24 field sites. The numbers of eggs, larvae, and adult beetles will continue to be recorded. Strategies will be implemented to protect the beetles from predators and to track the spread of the beetles.

Progress on Spending Funds

Roughly \$1,000 has been spent to-date to pay wages for a technician this summer.



Beetles are being released near Big Spring, Texas to control saltcedar.

4. *Leonardo Lombardini, Texas A&M University Horticulture Science Department.*
“Irrigation Scheduling in Pecan Orchards Using a Soil Water Balance Model.”

Overview

The overall goal of this project is to introduce an alternative method for scheduling irrigation in pecan orchards through the use of a soil water balance model. Validating the model in pecan orchards will allow this methodology to be used in different regions with varying climate conditions and to conserve water.

Activities Conducted This Quarter

A probe and data logger purchased for this study was received in June 2005. Two research sites were selected—the Texas A&M University Pecan Research Orchard and the U.S. Department of Agriculture Research Service (USDA-ARS) Pecan Breeding and Genetics Orchard. Both sites are located along the Brazos River bottom near the Texas A&M University campus. A scientific weather station was installed at the Texas A&M orchard and will provide climate data. In addition, the Texas A&M research team has met with experts in modeling soil-water balances (Dr. Bruno Basso from the University of Basilicata in Italy) to develop the protocol that will guide the research.

Activities Planned for the Next Quarter

Work is now underway to install soil probes in both orchards. Once the probes are in place, irrigation will be provided to only half the trees in each orchard. As soon as the treatments are initiated, soil moisture profiles will be collected and data will be gathered about both physiological parameters (i.e., water potential, carbon assimilation, transpiration, etc.) and environmental traits (precipitation, air temperature, humidity, etc.). Data collection will continue throughout the summer. Lombardini and graduate students plan to present preliminary data at the Annual Conference of the Texas Pecan Growers Association in July 2005.

Progress on Spending Funds

Roughly \$7,000 has been spent to-date.

5. G.J. Michels, Texas Agricultural Experiment Station at Bushland. "Biological Control of Saltcedar at Lake Meredith, Texas."

Overview

The overall goal of this study is to determine if the deployment of the saltcedar beetle (*Diorhabda elongata*) can be a successful biological control agent to manage saltcedar populations near Lake Meredith and in the Canadian River watershed and thus conserve water.

Activities Conducted This Quarter

In April 2005, surveys were begun to search for beetles (*D. elongata*) that were imported from northern Greece and transplanted near Lake Meredith to control saltcedar. Significantly, beetles were located that had survived harsh winter conditions on the Texas Panhandle. Since April, weekly surveys of the movement of these beetles have been conducted and it is evident that the insects are damaging saltcedar plants. In addition, 40 saltcedar trees near the site have been identified and their locations have been mapped. These trees, as well as grasses, shrubs, and forbs, will provide baseline data that will later be used to determine how the use of these beetles is affecting the vegetative cover of the research site. Data show that the beetles now cover an area more than 200 meters away from the site where they were first released. Education about this project was presented to the public through a television news interview that aired in Amarillo in June 2004.

Activities Planned for the Next Quarter

In late June, more than 112 additional beetles will be released at the research site. Insect populations, and the geographic area over which they are spreading, will continue to be recorded.

Expenditure of Funds

Roughly \$2,000 of this grant has been spent to-date, mainly on student salaries and costs to travel to the research site.



Students with project team release beetles near Lake Meredith.

6. Genhua Niu, Texas Agricultural Experiment Station at El Paso, and Raul Cabrera, Cynthia McKenney and Wayne Mackay, Texas Agricultural Experiment Station at Dallas. "Determining Plant Water Use and Crop Coefficients of Selected Nursery and Landscape Plants."

Overview

The overall goal of this project is to determine the water use and crop coefficients of selected landscape plants. The study will compare the differences in water use and crop coefficients that result when these species are grown in El Paso and Dallas. The project will also investigate water use trends in plants grown in containers versus plant species grown in landscapes.

Activities Conducted This Quarter

Seedlings have been purchased and are being grown in 3-gallon containers filled with commercial potting mix. Plant species being evaluated include black cherry, sand plum, sand cherry, Chinese elm, Russian olive, desert willow, and green ash. A field research plot was recently developed by clearing shrubs, leveling the area, applying mulch to the ground, and providing needed infrastructure to deliver water and electricity. The field plot is equipped with a weather station that will be used to collect climate data to estimate potential evapotranspiration and to develop crop water use coefficients. Seedlings grown in containers are now being grown outdoors at the field plot.

Activities Planned for the Next Quarter

During the next quarter, field studies will be conducted. Project leaders will work with Extension horticulture and forestry specialists to communicate the progress of this project to the public.

Expenditure of Funds

Roughly \$4,000 has been spent to-date.



This study will examine plant water use of plants grown in containers (below) and landscapes

7. Genhua Niu, Texas Agricultural Experiment Station at El Paso. “Impacts of Drought on Salinity Tolerance of Landscape Woody Plants Irrigated with Reclaimed Wastewater.”

Overview

The overall goal of this study is to evaluate the relative salinity tolerance and water use of selected shrubs and tree species under well-irrigated and drought-stressed conditions. The project will also analyze how these species take up sodium and chloride ions and translocate them into parts of the growing plant.

Activities Conducted This Quarter

Plants in 1-gallon containers were purchased from local nurseries and transplanted in 3-gallon containers. Plant species being evaluated include abelia, butterfly bush, holly, evergreen euonymus, and oleander. A field research plot was recently developed by clearing shrubs, leveling the area, applying mulch to the ground, and providing needed infrastructure to deliver water and electricity. The field plot is equipped with a weather station that will be used to collect climate data to estimate potential evapotranspiration and to develop crop water use coefficients.

Drainage lysimeters have been constructed and instrumented. They are being used to determine plant water use when plants are grown in conventional nursery conditions (in above ground containers) and in simulated landscape conditions (with drainage lysimeters).

Activities Planned for the Next Quarter

During the next quarter, field studies will be conducted. Project leaders will work with Extension horticulture and forestry specialists to communicate the progress of this project to the public.

Expenditure of Funds

Roughly \$4,600 has been spent to-date.



Lysimeters have been constructed in El Paso to determine plant water use.

8. Bobby Stewart, West Texas A&M University. “Seeding Dryland Grain Sorghum in Clumps to Decrease Tillering and Increase Grain Yield.”

Overview

The rationale behind this project is to investigate, through field research, whether growing grain sorghum in clumps has the potential to increase yields under water-short conditions. Previous studies suggest that growing grain sorghum in clumps may produce fewer tillers and less vegetative growth early in the season, thus leaving more water in the soil that can be used in the critically important grain-filling period.

Activities Conducted This Quarter

This project is now in the very preliminary stages. Work is now underway to plan the specific experiments that will be conducted as well as the sites at which they will be carried out.

Activities Planned for Next Quarter

Designs of field experiments are now underway. The research team is considering developing field plots at the WTAMU Nance Ranch and/or the United States Department of Agriculture Research Service (USDA-ARS) site at Bushland. The researchers plan to evaluate the effect of planting grain sorghum in clumps using a newly modified planter. Experiments will assess how growing grain sorghum in clumps affects the growth and water use of these plants. They will also study how this practice may affect the amount of light reaching the plants, thus also potentially affecting water use.

Expenditure of Funds

No funds have been expended to-date.



The project seeks to find out if growing grain sorghum in clumps may reduce water use and increase yields

9. *Giovanni Piccinni and Kenneth White, Texas A&M University Agricultural Research and Extension Center at Uvalde, and Thomas Gerik, Blackland Research and Extension Center at Temple. "On-Farm Research to Evaluate Irrigation Scheduling Tools to Increase Yield and Control Diseases."*

Overview

The goal of this project is to reduce the production costs of crops grown in the Rio Grande region by improving irrigation efficiency in stressful environments (i.e., where heat and drought stress occur) while controlling diseases such as aflatoxin and common root rot. The research will identify irrigation scheduling and farm management tools and educate growers about how to these methods to deal with factors that stress corn crops.

Activities Conducted This Quarter

Project leaders worked with cooperating corn growers and encouraged them to record soil moisture data on a regular basis during the growing season. Information from soil moisture sensors and data loggers was downloaded and graphs were developed and presented to cooperating growers at monthly meetings. The research team updated corn producers about soil moisture levels and potential evapotranspiration data in the Uvalde region. Information on how to take part in the Precision Irrigators Network was discussed with 90 crop producers who attended the Uvalde County Crops Tour in June 2005.

Activities Planned for Next Quarter

The research will be carried out on commercial corn fields in the Uvalde region. The project will identify threshold irrigation levels for corn grown under minimal tillage and no tillage conditions, and will identify best management practices to avoid water stress. The study will also evaluate water management technologies that can be adapted or modified to optimize conditions where only limited amounts of irrigation are available.

Expenditure of Funds

No funds have been spent to-date.



Texas Cooperative Extension Agronomist Charles Stichler discusses irrigation scheduling to cooperating growers at the Uvalde County Crops Tour in June 2005.

10. John Sij, Texas Agricultural Experiment Station at Vernon. "Managing Water Resources of the Seymour Aquifer Using Subsurface Drip Irrigation."

Overview

The overall objective of this project is to research and demonstrate how subsurface drip irrigation systems have the potential to conserve water and increase yields and profits for agricultural producers at sites in the Rolling Plains where groundwater resources are limited. The project will install, test, and monitor subsurface drip irrigation systems being installed at the Chillicothe Research Station. Research results will be demonstrated to agriculture producers in the region through demonstrations, field days, and Extension efforts.

Activities Conducted This Quarter

Work is progressing on the development of a water well that will support drip irrigation research at the TAES research site at Chillicothe. To-date, the location of the groundwater well has been identified through site surveys, and bids have been let to install the new well. Progress is also being made on developing plans to design the irrigation systems that will be installed and to identify drip irrigation studies that need to be conducted.

Activities Planned for Next Quarter

A new irrigation water well will be installed in July 2005. Once it is installed, the pumping capacity of the well will be tested and a pumphouse will be constructed. The well and accompanying drip irrigation system will be presented to participants at a field day on September 29, 2005. Roughly 200 participants are expected at the field day.

Expenditure of Funds

The process of transferring funds to this project is now underway. To-date, no funds have been spent.



This project will install a drip system at Chillicothe that will be similar to one built at Munday.