

# Wetting Front

## Soil and Water Management Research Unit Newsletter

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### SDI, LEPA, AND SPRAY IRRIGATION OF GRAIN SORGHUM . . .

by A. D. Schneider, T. A. Howell, and S. R. Evett

Subsurface drip irrigation (SDI), low energy precision application (LEPA) and spray irrigation are all highly efficient irrigation methods. Application efficiency, which is the percentage of applied water beneficially used by the crop, can approach 100% for SDI, range from 95 to 98% for LEPA, and exceed 90% for spray irrigation. With this small range in efficiencies, selection of the most effective irrigation method will likely depend on specific crops, soils and weather conditions. The objective of the field study reported here was to compare SDI, LEPA, and spray irrigation of grain sorghum on Pullman clay loam at the USDA-ARS Laboratory at Bushland, Texas.

#### Procedures

The experiment conducted in 2000 (later results from 2001 and 2002 are now available to be presented in 2003) was designed with two spray irrigation methods in addition to the SDI and LEPA methods. The spray heads for low elevation spray application (LESA) were positioned about 1 foot above ground, and those for mid-elevation spray application (MESA) were about 5 ft above ground. Full or 100% irrigation was sufficient irrigation to meet the grain sorghum water requirements determined by the North Plains ET Network. Deficit irrigated treatments received 0, 25, 50 or 75% of the application to the 100% irrigation treatment. All irrigation methods were evaluated under a lateral move irrigation system so that the crop could be uniformly established with spray irrigation.

Each of the three spans of the lateral move irrigation system spanned 48 30-in spaced beds and furrows - 12 for each irrigation method. The LEPA and spray application devices were located above alternate furrows, and the SDI drip tape was chiseled beneath alternate furrows. LEPA devices were double-ended drag socks connected with a hose and adapter to Senninger Super Spray heads. LESA devices were Senninger Quad IV spray

heads in the irrigate mode, and MESA devices were Senninger LDN spray heads with single, convex, medium-grooved spray pads. All three sprinkler devices used the same type nozzle and pressure regulator. The emitter spacing and flow rate of Netafim drip tape was varied from plot to plot as it was chiseled in to provide the five drip irrigation rates.

The MESA spray method was used across all plots to establish the crop with a 1-in application on May 27 for seed germination and a 1/2-in application on May 31 to soften the crusted soil. All additional irrigations were applied with the different sprinkler devices or the SDI dripline, except that MESA spray heads were used for the first seasonal irrigation of the LEPA plots. This was done to settle the furrow dikes before applying the high intensity LEPA irrigations. One-inch sprinkler irrigations were applied to the 100% irrigation treatments when the soil water deficit calculated from North Plains PET data reached one inch. An equal depth of irrigation was applied with drip tape, but irrigations were applied daily.

Cultural practices and crop management were similar to those used for high-yield on-farm grain production in the Southern High Plains. Disk bedding was used for primary tillage during the spring, and 0.76-m (30-in) spaced beds were formed with a disk bedder. After the last cultivation, all furrows were diked with a propeller-type diker that formed

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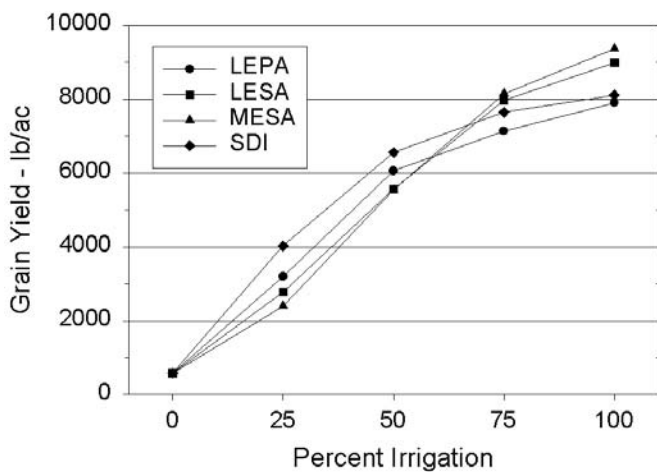
dikes at a 45E angle with the furrows. Adequate fertilizer, based on soil samples analyzed by a commercial soils testing laboratory, was applied to insure that fertility did not limit yields. On May 23, 2.0 pint/ac of Bicep herbicide was applied with a ground spray rig for weed control. The greenbug population gradually increased during the middle of the growing season, and on August 23, 1.0 pint/ac of Lorsban insecticide was applied through the lateral move irrigation system.

**Results and Discussion**

Grain yields for all combinations of irrigation amounts and irrigation methods are illustrated in Figure 1. Treatment

irrigation methods being most efficient with full irrigation.

Water use efficiencies calculated as pounds per acre-inch of all water used by the grain sorghum (WUE), and as pounds per acre-inch of seasonal irrigation water (IWUE) are listed in Table 1. WUE increased with irrigation amount from 102 lb/ac-in without irrigation to the 420 to 444 lb/ac-in range for 75% irrigation. At the 25 and 50% irrigation levels, WUE was largest with SDI, and at the 75 and 100% irrigation levels WUE was largest with the two spray irrigation methods. IWUE, however, tended to be larger for the smaller irrigation amounts and was smallest for 100% irrigation. IWUE exceeded 400 lb/ac-in for all treatments receiving seasonal irrigation and reached 662 lb/ac-in for 50% irrigation with the SDI method.



**Figure 1.** Grain yields for the four irrigation methods and five irrigation amounts.

yields ranged from 580 lb/ac without seasonal irrigation to 9370 lb/ac for 100% irrigation by the MESA method. For the 25 and 50% irrigation levels, yields with SDI were largest, and yields with LEPA were larger than for the two spray methods. For the two larger irrigation levels, grain yields were larger for the spray methods, and with 100% irrigation the difference exceeded 1000 lb/ac. Yields averaged across all five irrigation amounts only ranged from 4980 lb/ac for LEPA to 5380 lb/ac for SDI. This small range was due to the SDI and LEPA irrigation methods being most efficient with deficit irrigation and the spray

**Table 1.** Seasonal water use efficiency (WUE) and irrigation water use efficiency (IWUE).

Irrigation Amount	LEPA	LESA	MESA	SDI	Irrigation Amount Avg.
WUE - lb/ac-in					
0%	102	102	102	102	102
25%	278	251	214	375	279
50%	420	404	402	455	420
75%	376	434	444	434	422
100%	357	396	423	365	385
Irrigation Method Avg.	307	317	317	346	322
IWUE - lb/ac-in					
25%	506	496	407	662	518
50%	586	534	531	636	572
75%	484	546	559	519	527
100%	413	475	496	422	452
Irrigation Method Avg.	497	513	498	560	517

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Grain yields and water use efficiencies were larger than those reported in earlier grain sorghum studies at the laboratory. With 100% irrigation, grain yields for both the LESA and MESA sprinkler methods exceeded 9000 lb/ac. For the 50 and 75% irrigation levels, seasonal water use efficiencies were generally in the 400 to 450 lb/ac-in range and irrigation water use efficiencies were generally in the 500 to 600 lb/ac-in range. Both the grain yields and the water use efficiencies illustrate efficient use of the irrigation water during a hot, dry growing season.

### Conclusions

This one-year study suggests that the optimum irrigation method for grain sorghum is likely to vary with the irrigation amount. At the 25 and 50% irrigation levels, grain yield, WUE, and IWUE, were all larger with SDI than with the sprinkler irrigation methods. For the two larger irrigation amounts, the trends reversed, and larger yields and water use efficiencies were obtained with the two spray irrigation methods.

## Newsletter . . .

The *Wetting Front* newsletter is designed to foster technology transfer from our research to industry and to agricultural producers in the Southern High Plains and to improve communications with our stakeholders and partners. For actions or corrections to our mailing list, contact Mrs. Carole Perryman by fax [(806) 356-5750], e-mail (cperryman@cprl.ars.usda.gov), phone [(806) 356-5749], or mail [USDA-ARS, P.O. Drawer 10, Bushland, TX 79012]. The *Wetting Front* newsletter returns after a brief absence due to several factors. We hope to return to our semi-annual publication schedule.

## NEW SWMRU SCIENTIST . . .

by Paul Colaizzi

I joined the Soil and Water Management Research Unit in July, 2002, as an agricultural engineer. Before that, I was an irrigation extension specialist at Texas A&M University in Weslaco (Lower Rio Grande Valley). My interests and background are in irrigation design and management, remote sensing, geographical information systems (GIS), and precision agriculture. I've also worked with power and machinery, electronics, and modeling.

I spent most my life in Arizona. I attended the University of Arizona in Tucson, completing a B.S. in 1995, M.S. in 1997, and Ph.D. in 2001 in Agricultural Engineering; my Ph.D. minor was Remote Sensing and Spatial Analysis. I also attended Sul Ross State University in Alpine, TX for a year before enrolling at the U of A.

I had two previous experiences with the USDA-ARS at the Water Conservation Lab in Phoenix, AZ. They were both very positive. When I was an undergraduate, I was a research technician and engineering intern. I worked on a project that investigated high-frequency surface irrigation (level basins) for cotton. I did everything from field work to surface irrigation numerical simulation. It was concluded that increasing irrigation frequency in level basins (shortening intervals from the traditional 10-14 days to around 7 days) could be justified economically, especially during cotton fruiting. After that, I decided that I definitely wanted a career in the ARS.

Several years later, I did my Ph.D. research with the Water Conservation Lab's Remote Sensing Unit. I was one of three other graduate students involved with designing, building, and testing a remote sensing system that was mounted on a linear-move irrigation system. The system's purpose was to simultaneously acquire data on crop growth, water status, and nitrogen status at one meter spatial resolution as the linear move passed through a field. My role on the project was to investigate the relationship between canopy temperature (measured with an infrared thermometer or IRT) and volumetric soil moisture (measured with a neutron meter). Since the IRT can measure a whole field much faster than a neutron meter at a few points, my hope was that soil moisture could be estimated using an IRT and provide an irrigation manager with an image of soil moisture content across a field in almost real time. From my personal experience, that would be more valuable, quantitative information than the qualitative windshield survey could provide.

Much of this personal experience occurred while working for a commercial producer as an irrigation engineer between graduate degrees in Coolidge, AZ. At the time, the producer had about 2,500 acres of subsurface drip irrigation,



mostly cotton, grains, and watermelons. I supervised all the irrigation systems, which totaled 120 fields and a peak capacity of about 16,000 gallons per minute. Sixty percent of that came from groundwater with the remaining 40% from the Central Arizona Project (CAP). To schedule subsurface drip irrigations

equitably, I needed timely information on soil moisture for each soil and crop at the very minimum. Buried soil moisture sensors would not be practical or economical for such a large operation and remote sensing still lacked the timeliness and/or spatial resolution needed for daily irrigation management. Consequently, it made sense to work on further development of remote sensing explicitly designed for this purpose.

Upon arriving in the High Plains, it's apparent that irrigation water is used more efficiently here than anywhere else I've ever been. The use of center pivots is largely responsible for this, but it is also because of ET-based irrigation scheduling using daily faxes from the North Plains ET Network. Still, ET data cannot capture the inherent spatial variability present in individual circles, and I think water can be conserved even further if this variability could be considered. There is also great potential for subsurface drip irrigation in the region. Therefore, I encourage producers and extension agents to visit with me on these matters, as this input is always essential for R&D.

## RESEARCH UNIT REORGANIZED...

by Terry Howell

The Water Management Research Unit (WMRU) was combined with the Soil Management Team at Bushland to form the new Soil and Water Management Research Unit (SWMRU). This unit combines the two CRIS (Current Research Information System) projects for enhanced research coordination by adding Dr. Louis Baumhardt, Dr. Robert Schwartz, and Dr. Paul Unger (Collaborator) from the soils research team with the former water research team (Drs. Evett, Howell, and Tolk). These teams have always cooperated, but this reorganization provided a new opportunity to strengthen the interrelations while preserving the existing cooperation with the Renewable Energy and Animal Waste Research Unit on both energy use to pump water and animal waste resource management and use. The new unit continues to focus on dryland and irrigated cropping systems with a major emphasis on evapotranspiration research with renewed emphases on joint research on soil hydraulic properties and crop modeling. The addition of Dr. Paul Colaizzi, Agricultural Engineer, to fill the position that was held by Dr. Arland Schneider who retired in 2001, adds a renewed emphasis on remote sensing and GIS (geographic information system) use in dryland and irrigated agriculture and irrigation automation (both center pivot and microirrigation).

The new SWMRU permits easier accountability for joint fund use from the individual CRIS projects that are often mingled on joint purchases of common equipment for the soils and water projects. Also, the realignment permits greater flexibility in unit and laboratory leadership under Drs. Howell and Clark. The reorganization plan was reviewed by both the Southern Plains Area (Dr. Charles Onstad, Area Director) and the National Program Staff (Drs. Allen Dedrick, Dale Bucks, and

Robert Wright; Associate Deputy Administrator, and National Program Leaders, respectively).

## Internet News . . .

Visit our website at <http://www.cprl.ars.usda.gov> for a list of manuscripts published by our staff. The list can be found under "Research Programs" followed by "Software". Downloadable PDF files of manuscripts are continually being added.

Web Sites of current interest:

**PROFIT (Productive Rotations on Farms in Texas)**  
<http://sorghum.tamu.edu/>

**ASCE/WRI Standardized Reference Evapotranspiration documents**

<http://www.kimberly.uidaho.edu/water/asceewri/>

**Texas Panhandle Water Planning Area**  
<http://www.panhandlewater.org/>

**USDA-NRCS Photo Gallery**  
<http://photogallery.nrcs.usda.gov/>

**USDA-ARS Image Gallery**  
<http://www.ars.usda.gov/is/graphics/photos/index.html>

## Awards and Recognitions . . .

Congratulations to our tremendous staff!!! In 2001, Superior Performance Awards were given to **Louis Baumhardt, Karen Copeland, Don McRoberts, Carole Perryman, Robert Schwartz, and Judy Tolk**, and Outstanding Performance Awards to **Keith Brock, Jim Cresap, Steve Evett, Terry Howell, Grant Johnson, and Brice Ruthardt**.

In 2002, Superior Performance Awards went to **Louis Baumhardt, Steve Evett, Terry Howell, Carole Perryman, Robert Schwartz**, and Outstanding Performance Awards to **Keith Brock, Karen Copeland, Jim Cresap, Grant Johnson, Don McRoberts, Brice Ruthardt, and Judy Tolk**.

Cash awards were given to **Louis Baumhardt, Keith Brock, Jim Cresap, and Judy Tolk** in Dec. 2000, while **Terry Howell** received a service award in Sept. 2000.

**Terry Howell** received an outstanding paper discussion award from the *Journal of Irrigation and Drainage Engineering (ASCE)* in July 2002 from the Environmental Water Resources Institute of ASCE.



## Grant News . . .

IAEA (International Atomic Energy Agency) grant on "Accuracy and Precision of Neutron Scattering, TDR, and Capacitance Methods of Soil Water Measurement" with **Steve Evett** as PI was extended and funded with an additional \$8,000.

**Steve Evett** was awarded an ARS Post Doctoral Research Associate from ARS Headquarters funds (\$40,000-\$50,000 per year for a two-year appointment).

**Steve Evett** and Nazirbay Ibagimov (Uzbekistan National Cotton Growing Research Institute) were invited by USDA-ARS-OIC and the Science and Technology Center Ukraine to submit a proposal for \$3000,000 on "Crop Water Use and Irrigation Water Quality."

**Terry Howell (Co-PI)** along with **Bill Payne (PI)** and **Maria Balota** submitted a proposal on "Evaluation of Five New Drought Tolerant Corn Hybrids for Yield and Water Use Conservation in the High Plains" to the Texas Corn Producers Board.

**Terry Howell** collaborated with Bob Robinson and Reggie Jones (Texas Cooperative Extension, TCE) on a Southern Region Sustainable Agriculture Research and Education proposal on "On-Farm Demonstrations of Integrated Resource-Efficient Crop Production Systems for the Texas Panhandle" in conjunction with the Texas Agricultural Experiment Station and West Texas A&M University.

**Nolan Clark** submitted a proposal to USDA-NRCS for EQUIP funding for a project on the "High Plains ET Network."

**Louis Baumhardt** and **Terry Howell** are completing the fourth year of research on the Texas Agricultural Experiment Station supported grant project "PROFIT — Productive Rotations on Farms in Texas" [see <http://sorghum.tamu.edu>].

## Upcoming Events, Meetings, and Presentations . . .

### UPCOMING MEETINGS:

**February 4-5, 2003** — Central Plains Irrigation Conference, Colby, KS, attendees will be **Paul Colaizzi** and **Terry Howell**.

**February 16-18, 2003** — Sorghum Industry Conference, Albuquerque, NM, attendees will be **Louis Baumhardt**, **Paul Colaizzi**, **Terry Howell**, and **Judy Tolk**.

**February 26-28, 2003** — FAO Expert Meeting on Crop Water Productivity, Rome, Italy, attending will be **Terry Howell**.

**February 26 and 27, 2003** — Environmental/Safety Training in El Reno, OK, attending will be **Louis Baumhardt**.

**March 25-27, 2003** — ARS Precision Agriculture Workshop, Kansas City, MO, attending will be **Paul Colaizzi**.

**April 14-16, 2003** — Integrated Biological Systems Conference, San Antonio, TX.

**April 21-25, 2003** — National Conference for Office Support Professionals, New Orleans, LA, attending will be **Carole Perryman** and **Brenda Carlson**.

**May 7-9, 2003** — ARS & INIFAP Workshop on Water and Environmental Impacts, Tucson, AZ, attending will be **Terry Howell**, **Louis Baumhardt**, and **Paul Colaizzi**.

**May 12-15, 2003** — USCID/EWRI Conference, Phoenix, AZ, attending will be **Terry Howell** and **Paul Colaizzi**.

**May 22, 2003** — Bushland Wheat Field Day. For more information call Dr. Mark Lazar at (806) 677-5600 (or e-mail at [m-lazar@tamu.edu](mailto:m-lazar@tamu.edu)).

**June 10-13, 2003** — Texas Council of the Soil & Water Conservation Society meeting, Wichita Falls, TX, attending will be **Judy Tolk**, **Louis Baumhardt**, and **Robert Schwartz**.

**June 16-18, 2003**, Southern Conservation Tillage Conference for Sustainable Agriculture (SCTCSA) Annual meeting, College Station, TX, attending will be **Louis Baumhardt**.

**June 23-26, 2003** — EWRI (ASCE) Annual Meeting., Philadelphia, PA, attending will be **Terry Howell**.

**July 13-18, 2003** — (ISTRO) International Soil Tillage Research Organization Conference, Brisbane, QLD Australia., attending will be **Louis Baumhardt**.

**July 27-30, 2003** — ASAE Annual International Meeting., Las Vegas, NV, attending will be **Terry Howell** and **Paul Colaizzi**.

### UPCOMING PRESENTATIONS:

"Water Losses from Sprinkler Packages", **Terry Howell**, Central Plains Irrigation Conference.

"Sorghum Production Systems Under Sprinkler Irrigation", poster presentation by **Terry Howell**, **Brent Bean**, **Judy Tolk**, and **Louis Baumhardt**; "Comparison of SDI, LEPA, and Spray Efficiency for Sorghum" poster presentation by **Paul Colaizzi**, **Arland Schneider**, **Terry Howell**, and **Steve Evett**; "Modeling Row Spacing, Planting Date, Population, and Cultivar Maturity Effects on Dryland Grain Sorghum Yield" poster presentation by **Louis Baumhardt**, **Bill Payne**, and **Terry Howell**; "Water Use Efficiencies of Grain Sorghum Grown in Three USA Southern Great Plains Soils" poster presentation by **Judy Tolk** and **Terry Howell**; Sorghum Industry Conference.

"Simulating Water Use of Irrigated Corn on the Texas High Plains", **Tom Gerik**, **Terry Howell**, **Jimmy Williams**, **Wyatt Harman**, and **Evelyn Steglich**, Integrated Biological Systems Conference.

"Expansion of Irrigation in the mid South United States: Water Allocation and Research Issues", **Steve Evett** and **Dennis Carman**, USCID/EWRI Second International Conference on Irrigation and Drainage.

"Cotton and Sorghum Rotation Under Deficit Furrow Irrigation", **Terry Howell**, **Judy Tolk**, and **Steve Evett**; "Comparison of SDI, LEPA, and Spray Efficiency for

Sorghum”, **Paul Colaizzi**, **Arland Schneider**, **Terry Howell**, and **Steve Evett**; ASAE International Meeting.

“Long-term Tillage Effects on Soil Physical Properties”, **Louis Baumhardt** and **Reggie Jones**, ISTRO Conference.

## Technology Transfer News . . .

### CUSTOMER/CLIENTELE NEEDS:

**Robert Schwartz** provided methodology for thresholding dye stained micrographs of soil to a University Researcher.

**Robert Schwartz** discussed management issues with NRCS personnel regarding the timing and incorporation of pivot-applied effluent and potential guidelines that could be included into the Phosphorus Index being written for Texas.

**Robert Schwartz** discussed current phosphorus loading issues in Texas with employees of responsible agencies and stakeholders to provide scientific recommendations for improvement of phosphorus soil testing in Texas.

**Robert Schwartz** transferred the *IDSfit* Code to other scientists and some assistance has been provided for implementing this technology.

**Robert Schwartz** hosted a tour, of the dryland cropping research plots, for 25 international scientists attending the West Texas A&M University Dryland Workshop on 21 June, 2002. Various aspects of sorghum and wheat production were discussed in relation to tillage and water conservation practices.

**Judy Tolk**, **Terry Howell** and **Steve Evett** attended the NRCS-ARS-CSREES partnering workshop, “Water Resources for 21<sup>st</sup> Century: A National Hydrology and Hydraulic Engineering Workshop”, Nov. 26-30, 2001, Tucson, AZ, to promote coordination, collaboration, and technology exchange in the field of hydrology and hydraulic engineering between NRCS, ARS, and universities. **Steve Evett** presented a poster titled “Comparison of Five Profiling Water Content Probes in Three Soils”.

**Judy Tolk** conducted a tour of lysimeter facilities on Feb. 5, 2002 for Guy Fipps, TCE irrigation specialist, and technician Brian Treese who intend to develop similar lysimeter facilities to determine crop water use in an irrigation research and demonstration facility. Treese returned March 13 for a more detailed examination.

**Judy Tolk** attended the Feb. 26, 2002 meeting in College Station, TX of the Plant Physiology Working Group, a consortium of plant physiologists from ARS, TAMU, and TAES. The purpose of the working group is to examine crop modeling efforts, help develop a statewide graduate curriculum in crop physiology, and involve physiologists in crop improvement programs.

**Terry Howell** presented “New Ideas for Improving Irrigation Water Use Efficiency” at the Great Plains Foundation Symposium, ‘Protection and Utilization of Air and Water Resources of the Great Plains’, Texas A&M Center, Amarillo, April 1-3, 2002. **Steve Evett** was program co-chair and moderator; and **Judy Tolk** attended.

**Judy Tolk** conducted a tour of CPRL for an environmental science class (13 students and teacher) from San Jacinto Christian Academy, Amarillo, TX on April 16, 2002, emphasizing environmental issues facing agriculture today.

**Judy Tolk** and **Steve Evett** attended the Texas Council, Soil and Water Conservation Society, state meeting in Waco, TX on June 18-21, 2002. The emphasis of the meeting was “Partners in Water Quality”, which included a technical tour to view effluent control procedures of a dairy and constructed wetlands developed by M&M Marrs Company and City of Waco.

**Judy Tolk** served as a tour host for the NRCS Irrigation Tour for visiting irrigation scientists from China on July 25, 2002. The scientists viewed irrigation application technologies, climate instrumentation, irrigation scheduling procedures, and irrigated cropping systems.

**Steve Evett** fielded numerous requests for advice on soil water content measurement devices, including requests from USDA-ARS at Mississippi State; USDA-ARS, Pendleton, OR; the National Soil Tilth Laboratory, Ames, IA; University of Nebraska, Clay Center; USDA-ARS-SPNRU, Fort Collins, CO; USGS-BRD Canyonlands Field Station, Moab, UT; US Geological Survey, Austin, TX; USDA-ARS Jornada Experimental Range, Las Cruces, NM; and University of South Carolina, Columbia.

**Steve Evett** presented seminars comparing and contrasting the accuracy and usability of the currently available soil water measurement sensors to multiple groups: the High Plains Underground Water Conservation District, Lubbock, Texas (invited); the University of Arizona Department of Hydrology and Department of Soil, Water and Environmental Sciences, Tucson, Arizona (invited); the Soil and Water Conservation Program of the Southern Association of Agricultural Scientists Annual Meeting, 2002, Orlando, Florida (invited); the CREES regional micro-irrigation committee W-128 at San Antonio, TX; the USDA-ARS Laboratory at El Reno, OK; and to ARS and University of Mississippi researchers and Mississippi State and NRCS extension personnel at the USDA-ARS National Sedimentation Laboratory, Oxford, MS.

**Terry Howell** and **Steve Evett** attended the International Irrigation Show and Technical Conference Nov. 4-6, 2001, at San Antonio, TX, where they helped staff the USDA-ARS booth, and Evett presented “Water Use Efficiency Regulated by Automatic Drip Irrigation Control”.

**Steve Evett** delivered the seminar “ARS – NRCS Cooperative Efforts in Water Management” at the USDA-ARS National Sedimentation Laboratory, Oxford, MS, April, 2002, to ARS and University of Mississippi researchers and Mississippi State and NRCS extension personnel.

**Steve Evett** served as a trainer in the USDA Radiation Safety Staff’s Training of Trainers for Nuclear Gauge Radiation Safety in College Station, TX, Dec. 4-6, 2001, where he lectured on soil moisture measurement with nuclear gauges and new techniques for calibration and use of these instruments to trainees from ARS, NRCS, and the U.S. Forest Service.

**Steve Evett** hosted a scientific visit by the Head, Soil Fertility Department, Uzbekistan National Cotton Growing

Research Institute, Tashkent, and the Director, Uzbek National Veterinary Institute, Samarkand, at Bushland, TX, April 28 - May 11, 2001, for the purpose of planning a joint research project on crop water use and water quality.

**Terry Howell** presented the irrigation scheduling research and crop coefficient development summary to the WCC-202 meeting in Reno, NV. He presented a field tour and discussion of High Plains water issues to an international workshop sponsored by the West Texas A&M University Dryland Agriculture Institute on June 21, 2002.

**Louis Baumhardt** provided EPA Worker Protection training Sept. 19, 20, and 24, 2001. There were 66 attendees.

**Steve Evett** provided HazMat training on June 5, 2001 for 39 attendees and on June 4, 2002 for 20 attendees.

#### **MEDIA CONTACTS:**

**Judy Tolk** assisted Darrel Watts, professor emeritus from the University of Nebraska, on July 8, 2002, with the production of a video on center pivot irrigation technology that will be shown to farmers, extension agents, and other interested individuals at field days, workshops, and related training sessions. The video will emphasize the irrigation research underway at CPRL, including low- and mid-elevation spray application, furrow diking, and drip technologies.

**Terry Howell** was interviewed for the CREET Beat by KGNC Radio on December 5, 2001, about the PROFIT (Productive Rotations on Farms in Texas) regarding grain sorghum production systems under sprinkler irrigation. **Judy Tolk** was interviewed for CREET Beat, which was broadcast Aug. 2 on KGNC Radio in Amarillo, TX. The topic was the 2001 yields from spray irrigated, drip irrigated and dryland cotton.

**Steve Evett** helped Stacy Pandey of the Texas Water Development Board write a section on soil moisture monitoring for the Board's irrigation management guide in July 2002.

**Steve Evett** updated the laboratory internet site to include papers on drip (micro-) irrigation and automatic irrigation scheduling using plant leaf temperature measurements.

Andrew Burchett from the *Farm Journal* contacted **Terry Howell** about the advantages of sorghum as a lower water using crop than corn and how it might relate to ethanol production for an upcoming article..

#### **PUBLIC RELATIONS:**

**Terry Howell** participated on an interagency study team to view water resource issues and irrigation technology in the P.R. of China that was sponsored by the USDA-ERS and hosted by the Ministry of Water Resources in October 2001.

#### **VISITORS:**

On April 26, 2001, Mr. Gao Jizhang, president, Dr. Xie Chongbao, senior researcher, and Dr. Xu Di, deputy director of the Department of Irrigation, China Institute of Water Resources and Hydropower Research; Mr. Liu Yun Bo, senior engineer of the Ministry of Water Conservancy; and Dr Liu Yu, senior researcher, and Mr. Huang Bin, senior engineer, National Center for Efficient Irrigation Technology and Research, visited with Drs. **Terry Howell**, **Arland Schneider**, **Steve Evett**, and **Judy**

**Tolk**, as well as **Byron Neal** of the Energy, Soil, and Animal Waste Resources Research Unit, to learn about irrigation systems and technology.

Robert Lascano (TAES, Lubbock) and Steve Maas (Texas Tech University) visited with unit scientists about crop water use, remote sensing, and precision agriculture on August 26, 2001.

Joe Ritchie (retired from Michigan State University) visited to discuss crop modeling and crop evapotranspiration on August 30-31, 2001.

On December 17, 2002, Dr. Jiusheng Li, chief, Department of Efficient Irrigation, National Center of Efficient Irrigation Engineering and Technology Research, Beijing, China, met with Drs. **Terry Howell**, **Steve Evett**, and **Judy Tolk** concerning irrigation research underway at Bushland.

On Dec. 19, 2002, Giovanni Munoz of the Food and Agriculture Organization of the United Nations visited with Drs. **Terry Howell**, **Steve Evett**, and **Judy Tolk** concerning data for the update of a manual which presents methodology to quantify yield response to water which will be distributed for use internationally.

#### **SEMINARS/PRODUCER/CLIENTELE MEETINGS/PRESENTATIONS:**

On Dec. 16, 2002, **Drs. Terry Howell** and **Steve Evett** made presentations at Bushland concerning irrigation technology to Syed Hussain Anwari, minister; Mohummad Qaseem Qaderi, head of research; Shah Mir Amiri, head of extension; Abdul Hadi, head of seed; Sayed Habib Rahman Sadat, head of plant protection; and Asadullah Molakhail, IFDC-Afghan Chief agronomist, Department of Agriculture and Livestock, Afghanistan.

#### **POPULAR MAGAZINE ARTICLES:**

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## Personnel News . . .

**Judy Tolk** arranged a training workshop for the laboratory on SAS PROC MIXED led by the SPA Statistician, **Tom Popham**, on August 14-17, 2001.

**Dr. Arland D. Schneider**, P.E. retired October 29, 2001 from USDA-ARS. He began in 1965 and had 36 years of service with USDA-ARS in addition to military service. Arland and his family are living in Puyallup, WA, and he is working for Hedges Engineering in Sumner, WA doing civil engineering design and consulting.

**Keith Brock**, **Grant Johnson**, **Don McRoberts**, and **Brice Ruthardt** received promotions in 2001, and **Steve Evett** was promoted by RPES in 2002.

**Carole Perryman** was appointed by the Southern Plains Area Director, Dr. Charles Onstad, to serve on the Southern Plains Area Advisory Council for Office Support Professionals in May 2002.

**Steve Evett** completed a 5-1/2 month detail to Little Rock, AR to plan an ARS Irrigated Watershed Research Unit in cooperation with the USDA-NRCS and the University of Arkansas to serve the growing irrigation in the Mississippi River Delta and southeastern United States

**Louis Baumhardt** broke his leg in an off the job accident on September 13, 2002 (yes, it was Friday the 13th). He is at home recovering (and on a flexible workplace agreement permitting him to work at home), and he hopes to be back at work full time by mid February.

**Paul Colaizzi** attended the ARS New Scientist Workshop at College Station TX on October 21-23, 2002.

**Terry Howell** and **Brice Ruthardt** attended a GIS/GPS training course at North Carolina State University on October 28-31, 2002.

**Paul Colaizzi**, **Carole Perryman**, **Steve Evett**, **Terry Howell**, and **Robert Schwartz** attended a Grant Writing Workshop sponsored by the Southern Plains Area Office in Houston, TX on November 7-8, 2002.

**Nolan Clark**, **Steve Evett**, and **Terry Howell** met with USDA-NRCS Southern Region leaders and other Southern Plains ARS scientists to discuss enhancing cooperation between the NRCS and ARS in El Reno, OK on December 11-12, 2002.

**Nolan Clark** and **Terry Howell** met with John Mueller, State Engineer, and Jerry Walker, State Water Management Engineer, from USDA-NRCS in Temple, TX on December 18, 2002.

**Bob Sears**, our former laboratory administrative officer, passed away December 20, 2002 after a long fight with cancer. We miss him very much and extend our sympathy to his family.

The SWMRU welcomes **Madelyne Gonzalez** as our new CPRL Administrative Assistant, who reported on January 27, 2003 from Hawaii.

**Steve Evett** will begin a 4-month sabbatical beginning in March 2003, to finish a project with the International Atomic Energy Association in Vienna, Austria.

The Unit depends on our summer student employees. Thanks to the 2002 summer students employees! **Aaron Alexander** worked for Dr. Judy Tolk; **Alanna Bolwahn** and **Wade Davis** worked for Dr. Robert Schwartz; **Klara Fielder** worked for Jim Cresap; **Sheen Kottkamp** worked for Dr. Steve Evett; **Pam Richardson** and **Robert Villarreal** worked for Keith Brock; and, **Lisa Unruh** worked for Dr. Louis Baumhardt. Students helping during the school year include **Cody Petersen**, **Josh McCrary**, **Russell Patrick**, and **Duncan Vernon**.

## Security . . .

In response to the need for heightened security, visitors and employees now wear name badges for recognition. Visitors are required to check in at the main building upon entering the property; register name, time of entry and exit; and obtain and wear name badges while on location. Other agency security protocols are being used.

## EEO Calender . . .

USDA-ARS-CPRL promotes awareness of the population diversity of our country:

Black History Month, February  
National Women's History Month, March  
Asian American/Pacific Islander Heritage Month, May  
National Hispanic Heritage Month, Sept. 15-Oct. 15  
National Disability Employment Awareness Month, October  
American Indian Heritage Month, November

For resources and information on EEO/Civil Rights/Diversity Awareness, visit the ARS website:  
<http://www.ars.usda.gov/eo>



Yes, even in a poor year like 2002, we can grow some cotton at Bushland.



## Soil and Water Management Research Unit

<http://www.cpri.ars.usda.gov>

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