Research and Education Project Reports

Ambika Chandra (Hard copy handout passed around on linear gradient for turfgrass)

(For) Guy Fipps
- Different turfgrass varieties with different irrigation amounts, looking at response from various irrigation levels
- Determine minimum crop water requirements for city ordinances restricting water use

Nolan Clark, USDA Agricultural Research Service, Bushland
- Hired to see if sprinkler irrigation works on the high plains – proven it does
- Research leader for manure management and renewable energy group
- Co-leader of Ogallala project:
  - 12 of 16 scientists at Bushland are engaged in water research
  - Handout: 2007 Ogallala research accomplishments passed out
  - At $3.6 million funding right now. If Congress passes appropriation bill, go over $4 million.
  - Mission – ensure sustainability of agricultural water supplies
  - Participants: ARS Bushland, ARS Lubbock, Kansas State University, Texas A&M University, Texas Tech University, West Texas A&M University

Annual solicitation for programs
- Program divided by 7 research priority areas
- Funding special projects: looking at interaction between policy changes on water issues and water level in the aquifer (economists and hydrologists), $1 million for four years

Automation of pivot systems using plant temperature
- System next year will be integrated in with Valley-integrated system using wireless system

Remote sensing of ET
- Doing over-flights; predict ET rates for 20 counties at one time

Serve on DOE committee – looking at water-energy nexus prediction that by 2030 going to double electric generator capacity in the United States
- Need some new power source besides steam else it will double water use
- Currently 38% of water is used for energy nationwide
- Water quality is important, not cost because consumers pay the cost
- Costs more to treat brackish water as opposed to buy good quality water (such as irrigation)

Another crop scenario (what if) model:
- Crop-Water Allocator (can be found at http://www.oznet.ksu.edu/mil/cwa/)

Don Ethridge & Jeff Johnson, Texas Tech University
- Involvement in Ogallala
  - Texas Reliance for Water Conservation – Floyd and Hale counties
  - Demonstration project cooperating with 26 producers in the counties
  - Multi-institution (Texas Tech, Extension Service, High Plains Underground Water District, Natural Resources Conservation Service)
  - Objective: Come up with environmentally and economically sustainable systems – continuous cotton, forage, livestock, integrated cotton and livestock system looking at production and water use and net farm income
- Long-term project; started 2 years ago; total 10-year project
- Massive amount of real-time data being collected
- Main focus is water conservation; looking at saving water by adjusting production systems from crops to livestock
- State objective is water conservation with minimum economic impact.
- Vivian Allen, Calvin Trostle, Phil Johnson work on the project; funded through TWDB

Three other smaller projects/areas of work:
- Craig Bednarz – looking at irrigation of cotton and grain sorghum and their responses under drip irrigation. Water use efficiency focus
- Gerald Henry, plant and soil sciences – looking at drip irrigation in turf systems, including turf varieties under drip
- Steve Moss (joint with ARS lab) – looking at different irrigation systems primarily in cotton production; doing a lot of geographical mapping of systems both under irrigation and not under irrigation
- Micah Farmer, hydrologist in Junction – working on water planning for Upper Guadalupe River, proposal right now; watershed planning project, irrigation is only a piece of it. Focusing more on regional planning and municipal planning issues
- Jeff, Jim and Dana – drip irrigation investment analysis on uniformity issues on water distribution within the system; interaction between water use and new cotton varieties – optimal input use

**Thomas Marek, Texas Agricultural Experiment Station, Amarillo, Bushland & Etter**

- True variable radial irrigation system funded through Ogallala
- Limited irrigation functions with corn breeder out of Lubbock
- Cotton modeling trying to develop for High Plains
- Work with Giovanni on developing crop coefficients using lysimeters for TXHPET and PET models with the Precision Irrigators Network
- Development of irrigation interface tools and cooperation between North Plains, South Plains and TXHPET models (grower profiles, set-up on field basis), funded through technology transfer division of Ogallala initiative – what more progressive growers want and need
- Irrigation demand estimation models.
- Request by TWDB to continue doing irrigation estimates because of its performance-based results, involved for Region A planning and larger hydrology projects where providing estimates and evaluating socioeconomic impacts on policy
- Doing probability analysis not just average values but real-time values on effect on aquifers
- New lysimeter design and operation parameters
- Sprinkler design work for reference lysimeter fetch values (work done with Terry Howell)

**Remote Sensing of ET**
- Trying to validate field-by-field situation, then integrating for spatial aspect; look at temporal aspects
- How many snapshots do you need per area to validate
- Crop color and temperature
- New instrumentation working with UT
- Controlling dust with irrigation
- Feed yards spend a lot trying to control dust using a lot of water; shallow lysimeters monitoring dust control
- Adding associated tools on ET network – weather, velocity for wind, proactive type recommendation

**Steve Amosson, Texas Cooperative Extension, Amarillo**

- Involved with Thomas, Terry, Utah, TCU – developing irrigation demand methodology for the state
- Economics of irrigation systems: Cost of transporting water, part of Region A plan
- Economic evaluation of alternative management strategies identified by and includes water demands and implications from an economic standpoint to save water
- Value of water for various agricultural uses.
- Agricultural water demand modeling (with Thomas)
- Working on baselining some activities to measure impacts of Ogallala aquifer; of these policies we’ll be looking at, part is socioeconomic
- Economic Evaluation of AgriPartners project
- Wind-power irrigation and feasibility
- Economic aspects of water use associated with ethanol, including plant and breaking up by different crop phases (under Ogallala)
- Irrigating for dust control in cattle feed lots

Karl Steddom, Texas Cooperative Extension, Overton
- East Texas Irrigation Association put research plots in for us (just getting started)
- Plant pathologist, water drives most diseases. Water conservation strategies should reduce disease.
- Plots set up with six different plot irrigation controls. Looking at water savings, reduction of disease, fertilizer, leaching and soil moisture fluctuation – East Texas has high rainfall, sandy soils

Vincent Haby, Texas Agricultural Experiment Station, Overton
- East Texas has two major aquifers: Carrizo – shallow 250-270 feet – and Wilcox aquifers
- Water quality in aquifers is different
- Wilcox water – high bi-carbonate, high sodium = iron deficiency in blueberries
  - Establish historic use of water
  - Just getting into use for forage irrigation
- Carrizo better for irrigation; some iron and sulfur, but not as salty as Wilcox
  - Going to start using for supplemental irrigation of forage crops
  - Have a lot to learn about irrigation implementation, design, etc.
- No one providing irrigation support at this point

Xavier Peries for Juan Enciso, TAES/TCE, Weslaco
RGBI Task 4 On-Farm Irrigation Management – Research
- Develop crop coefficients on soybean and corn
- Try to analyze impact on melon and onion yields and quality if apply irrigation at different levels; irrigation probes
- Main idea: yield and quality response to deficit irrigation (based on different percentage of ET field capacity levels)
RGBI – Extension
- 12 different cooperators
- Give guidelines and soil moisture measuring, uniform measurements
Cotton Incorporated in St. Lawrence area in West Texas
- Installed drip systems on cotton, try to evaluate how they stand up after 20 years of use
- See uniformity of drip over time.
Evaluate best management practices (BMPs) for non-point source pollution in the Arroyo Colorado watershed (with Texas State Soil and Water Conservation Board)
- Six BMPs have been chosen, still in process of being approved
- What is the impact of leaches and runoff in the watershed
- Three samplings per site, also have lysimeters installed to get sampling from groundwater (analyze water quality parameters, pH, phosphorus, oxygen, etc). Two-year study with sampling
- Main idea: create simulation model
New direction Center in Weslaco is taking – going towards bioenergy production (ethanol, biodiesel)
- Not much into it right now, but it all needs water. Currently need to find funding
For Shad Nelson, Texas A&M University Kingsville
Agricultural Demonstration Initiative through TWDB in Harlingen Irrigation District, Cameron County
- Evaluating pivot systems on different crops and turf; find how uniform they are
- Economics involving that project and how much it’s going to cost
- Compare irrigation technologies – drip, pivot, flood, etc.
- Main focus: Maximize irrigation use efficiency at the farm level
- Provide efficient irrigation scheduling
- Companion project to one on High Plains looking at water conservation through more precision irrigation methods

Danny Fromme, Texas Cooperative Extension, Uvalde
- Began in Uvalde May 1, 2007
- Looking at getting precise management on irrigation termination on the last irrigation of cotton
- Using heat unit concept and when cutout occurs know it is before flower
- Very little yield comes from 5 nodes above white flower
- Looking at concept of getting irrigation done from heat unit to cutout
- Precisely measure what’s been applied and how much is in the soil when last irrigation is made
- Precisely putting last irrigation on has value
- Cotton Incorporated is also interested in it

Lloyd Nelson, Texas Agricultural Experiment Station, Overton
- Plant breeder, ryegrass breeder
- Selected dwarf short ryegrass for turf used for over-seeding sports fields and home lawns, but requires a lot of water for establishment (8 days in a row); interested in selecting for drought tolerance
- Selection for high salinity, doing some research in greenhouse – grow plants in sand and grow in salt tanks, increasing salt up to 18-20,000 ppm (50% of seawater)
- Have some tolerance, making progress in making high salt tolerance
- Take out to Pecos and put under select irrigated systems at the Pecos Center. Hoping to get selection there for high salt tolerance
- Getting funding from USGA – study next 3 years
- Need high salt-tolerant ryegrass

Giovanni Piccinni, Texas Agricultural Experiment Station, Uvalde
1) Determination of crop water use and crop coefficients for agronomic crops in collaboration with Leskovar on vegetable crops
- Collaborate with ARS group at Bushland, Thomas Marek and Arland Schneider to engineer, modify and make lysimeters better; originally started with three, now have seven in-ground laying lysimeters
- Built similar to small lysimeter at ARS Bushland
- One on tall fescue grass to look at ETo evaluation and do comparison of actual ETo versus calculated ETo looking at micromromatic changes
- Last two built have two different types of soil and were funded by Wintergarden Water Conservation District to look at crop water use with soils from their district
- Work with Daniel on corn, cotton, sorghum, onion and spinach
- At this point, keeping facility for determining crop water use and development of crop coefficients to put in formula
2) Use crop coefficient for actual irrigation management
- Given water restrictions in Uvalde region (limited to pump no more than 2 acre-feet per year from aquifer) = limited deficit irrigation
- Not enough water for two crops or given the economics of area; strong interest from SAWS to purchase water rights from growers to use for San Antonio region that is expanding rapidly
- Growers leasing or selling water rights; less risky to lease or sell water than farm with, but can only sell 1 acre-foot
- Predominant to work on limited irrigation
- Develop crop coefficient under limited irrigation –pivot and drip
- Looking at classical approach of 75% ETc
- Time of year where we can go 50%, then replenish full need
- Working with Danny Fromme on when to cut irrigation

3) Trying to develop decision support system (DSS) for irrigation management
- Teamed up with Temple group working with CroPMa for long-term decision making
- Will be true interest to growers – what if scenarios to reduce water use yet maintain yields – start looking at going down to 100 bushels corn to save more water to sell and make supplementary budget

4) Developing in-season group, built identically to TXHPET on smaller scale
- Give in-season advice to growers on how much to apply or has been applied naturally
- Ideally, like to continue working on that to develop crop coefficient
- Compare to see variability of CWU and crop coefficient; move away from on-station besides lysimeter work; move more to on-farm working with growers
- Look at different irrigation practices, methods and water conservation, tie in to soil moisture modeling, CroPMa and other modeling at Temple
- Have overcome some of the growing pains; it’s getting better every year
* Consortium could serve tremendous opportunities for those that have not been within the system for too long and may not have those ties

**Jin Ye, Biological and Agricultural Engineering, College Station (with Guy Fipps)**
- Demonstration project using different drip lines from different manufacturers
- Purpose: See what are the endurances of these products
- Subsurface drip irrigation

**Daniel Leskovar, Texas Agricultural Experiment Station, Uvalde**
- Vegetable crops, drip irrigation, subsurface drip, LPS
  Precision Irrigators Network
- Monitor vegetable crops; stand establishment; transplants – try to reduce their stress
- Artichokes, melons, tomatoes, peppers
- Deficit irrigation practices studying nitrogen and impact on crop quality
- Alternate crop strategies for irrigation for potential crops that may have a niche in Texas
- Working on stand establishment and irrigation on onions with John Jifon in Weslaco

**Dana Porter, TAES/TCE, Lubbock**
- Look at improving management and drip irrigation
- Paul Colaizzi has subsurface drip irrigation work – high-tech
- Trying to compliment both of their research programs
- Compliment Craig Bednarz work – looking at improving models and cotton growing
- Explosion of new, stripper varieties
- A lot of collaboration and support for agronomy, plant pathology, entomology, etc.
Extension – Irrigation Training Program (ITP)
- Developing curriculum
- Have a lot: Extension and research from A&M and other universities, trying to package it into a curriculum that makes sense for higher-level growers and make trainings for county Extension agents
- Working on manual and conduct six workshops around the state
Charge as Extension Specialist to train county Extension agents
- Strategic planning and evaluation – developed specific questions to ask, specific topic areas to address, break-out at agent request, subcategories, etc.
- Hopefully will help in accountability reporting and help county Extension agents to feed into that. Report on district, region and statewide levels
TXHPET Network
- Expanded number of stations, expanded tools; came about b/c just wanted to work together
USDA-ARS Ogallala Aquifer Network
- Technology transfer project (collaboration) – has been an useful, effective way to get collaborations organized and are developing materials together

Jim Bordovsky, Texas Agricultural Experiment Station, Lubbock

Transition from fully-irrigated to dryland production because we’re running out of water; a lot of interest for that water for other uses
- Maintain economy of area while transition occurs
- Field-laboratory-based concepts – what can we do with a little bit of water
- Get most of rainfall during growing season, so want to take advantage of rainfall
- Look at extremes – what can you do by adding a little supplemental irrigation with natural water resources? Or take water from whole area and concentrate on smaller areas and fully manage top-of-the-line outdoor greenhouse
- Started looking at cotton/sorghum rotation irrigating with LEPA system; put out 5 inches per season; double for next at 10 inches
- Producers base on price of commodity
- Over last two years, changed protocol on how we irrigated that rotation
- 20-acre area under pivot where rotation is established
- Limited to how much water can be applied; sales of water, water marketing is a compliment
- Treatments with cotton/sorghum rotation – apply pre-plant only irrigation, don’t put in crop if we don’t have soil-water content higher than certain level or use 4 or 5 inches of water
- Superimposed across different crop rotations – on all of these, one dataset is already completed (worked with Evelyn Steglich and Wyatte Harman at Temple on modeling) and will see where we can expand dataset
- Want to be able to make decisions in growing season of limiting the amount of water and direct it to something else
Working with Steve Moss on Crop2K program
- Economic part: getting datasets ready for graduate student to work on
- Inverse is fully irrigating crop
- Work in that area has to do with drip irrigation, the most efficient way to deliver water to a crop
- A lot of work overcoming some of the problems with subsurface irrigation – germination during dry period, soil amendments; addressing depth and location of drip laterals in field
- Installed 16 acres of drip in shallow area to address germination; will likely have various shallow drip installations
Row Creep – another situation with drip
- Trying to maintain crop rows...one row will be closer than adjacent rows, over years it can move
- Set up small plot area (4-5 acres), have offsets of drip tape relative to crop rows
- Looking at putting drip laterals perpendicular to crop rows to look at effect of drip on production (increase or decrease, long-term soil properties)
- Looking at different row spacing (30-inch, 40-inch row crop spacing)
Collaboration on various spacing where we’re using water at different levels and measuring crop response
GPS guidance system for installation (used by less than 50%)
Evelyn Steglich, Texas Agricultural Experiment Station, Temple

- Three main projects
  1) Through use of crop production functions, develop IrrigAID worksheet (Wyatte, TWDB)
     - Excel worksheet put in crop system, irrigation cost (calculator) – how much water you have available
       – set up for cotton, corn and sorghum
     - Allows you to play “what if” games on do either allocating all water to one crop or divvying it up
       between all two or three
     - Breaks up into three stages
     - Economic threshold – how much do you gain by putting on an extra irrigation?
     - Lower Rio Grande Valley and Uvalde are using it; getting it ready for the High Plains
  2) Rio Grande Basin Initiative
     - Worked one-on-one with growers in past to help manage their irrigation – time consuming because it
       was on a weekly basis
     - Developed a soil-water management tool (CroPMan, WinEPIC) to input cropping system,
       fertilization, irrigation, cropping practices, soil information, water table and anything else that would
       help supply irrigation schedule
     - Input all information and get 14-day available soil water by layer
     - Have this tool for the Rio Grande Valley; plans for Wintergarden, Coastal Bend and eventually High
       Plains (slow process because the Web programmer quit)
     - Working with Tom McLemore (Harlingen irrigation district manager)
     - Different opinions on salinity issue in the Rio Grande Valley
     - Took soil samples and salinity analysis before and after crops; will compare the numbers
     - Use those numbers to help validate EPIC
  3) Precision Irrigators Network project working with Giovanni Piccinni
     - What-if scenarios on what the producers have been doing; have last year’s irrigation rates
     - Used several different levels above and below what they applied – determined economic analysis and
       yields; doing again this year