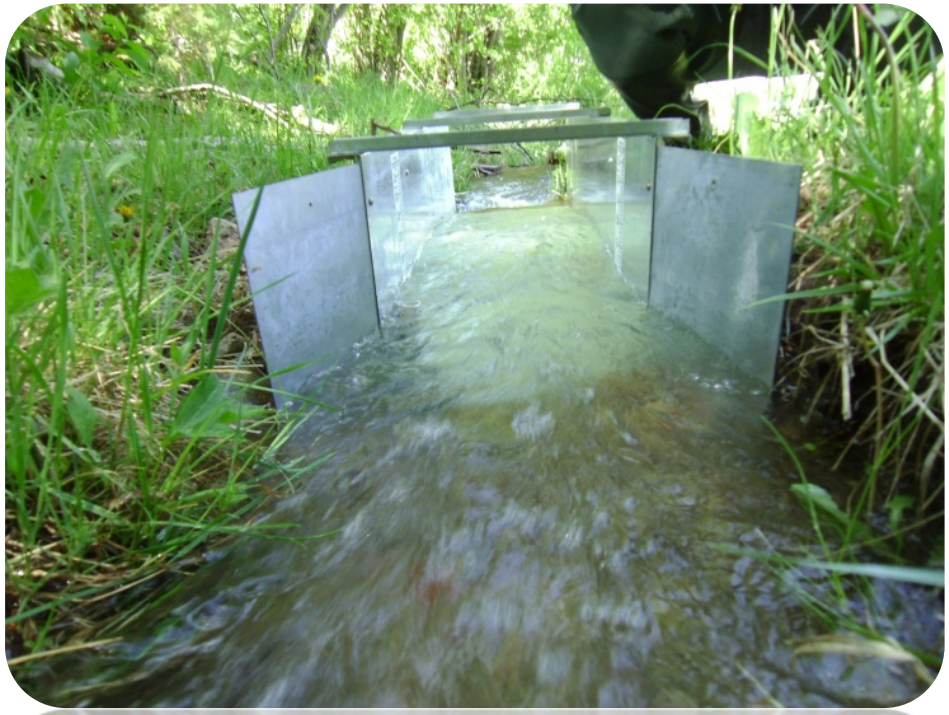
Irrigation efficiency



Sam Fernald

Director

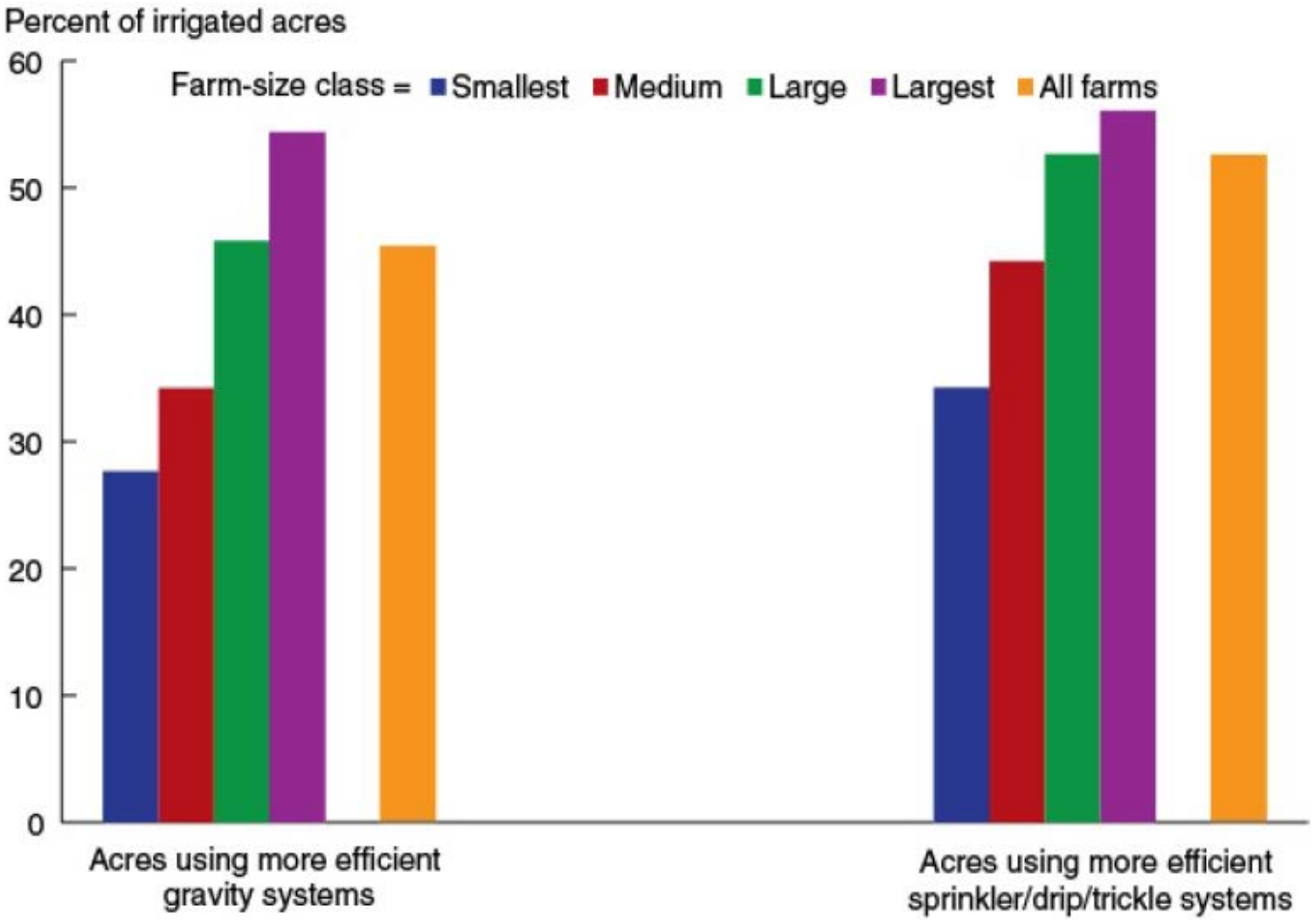
NM Water Resources Research Institute

Presented to

SCIENCE, TECHNOLOGY AND TELECOMMUNICATIONS COMMITTEE

18 October 2013

ROOM FOR EXPANDED USE OF EFFICIENT IRRIGATION TECHNOLOGY



Note: Farm size determined by annual sales.
Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, 2008 Farm & Ranch Irrigation Survey.

Rio Grande Basin Initiative

A sampling of irrigation efficiency research in New Mexico and Texas 2003-2012

This material is based on work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under Agreement No. 2010-34461-20677, Agreement No. 2010-45049-20713, Agreement No. 2009-34461-19772 and Agreement No. 2009-45049-05492.

TEXAS A&M UNIVERSITY

TEXAS A&M AGRILIFE RESEARCH | EXTENSION

Texas Water Resources Institute
make every drop count

NM STATE UNIVERSITY

Water Conservation Objectives, Collaboration and Accomplishments of the Rio Grande Basin Initiative

WRRI

USDA United States Department of Agriculture National Institute of Food and Agriculture

Texas Water Resources Institute

NM State University Agricultural Experiment Station Agricultural Extension Service

AgriLIFE RESEARCH & EXTENSION

Texas A&M AgriLIFE RESEARCH

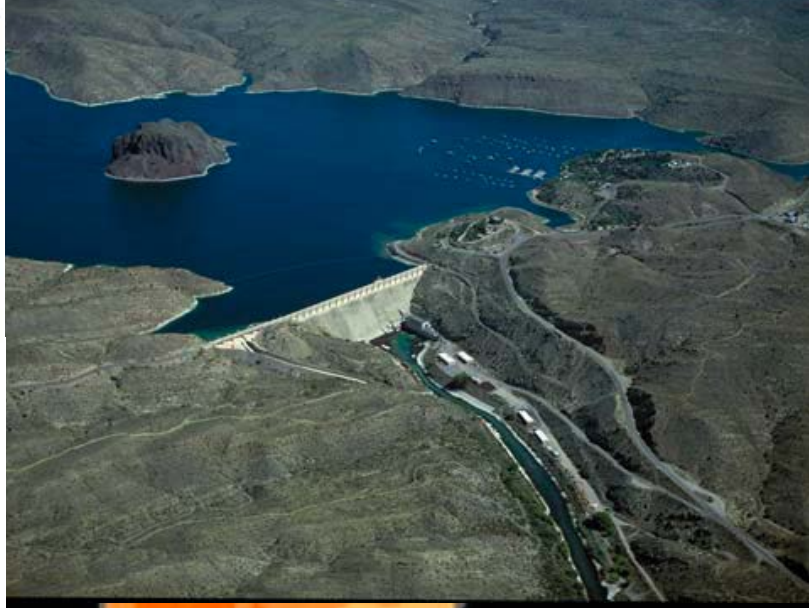


Photo from Guy Fipps

RGBI - 9 Focus (Task) Areas

1 – Irrigation District Studies

2 – Irrigation Education and Training

3 – Institutional Incentives for Efficient Water Use

4 – On-Farm Irrigation System Management

5 – Urban Water Conservation

6 – Environment, Ecology and Water Quality Protection

7 – Saline and Wastewater Management and Reuse

8 – Basinwide Hydrology, Salinity Modeling & Technology

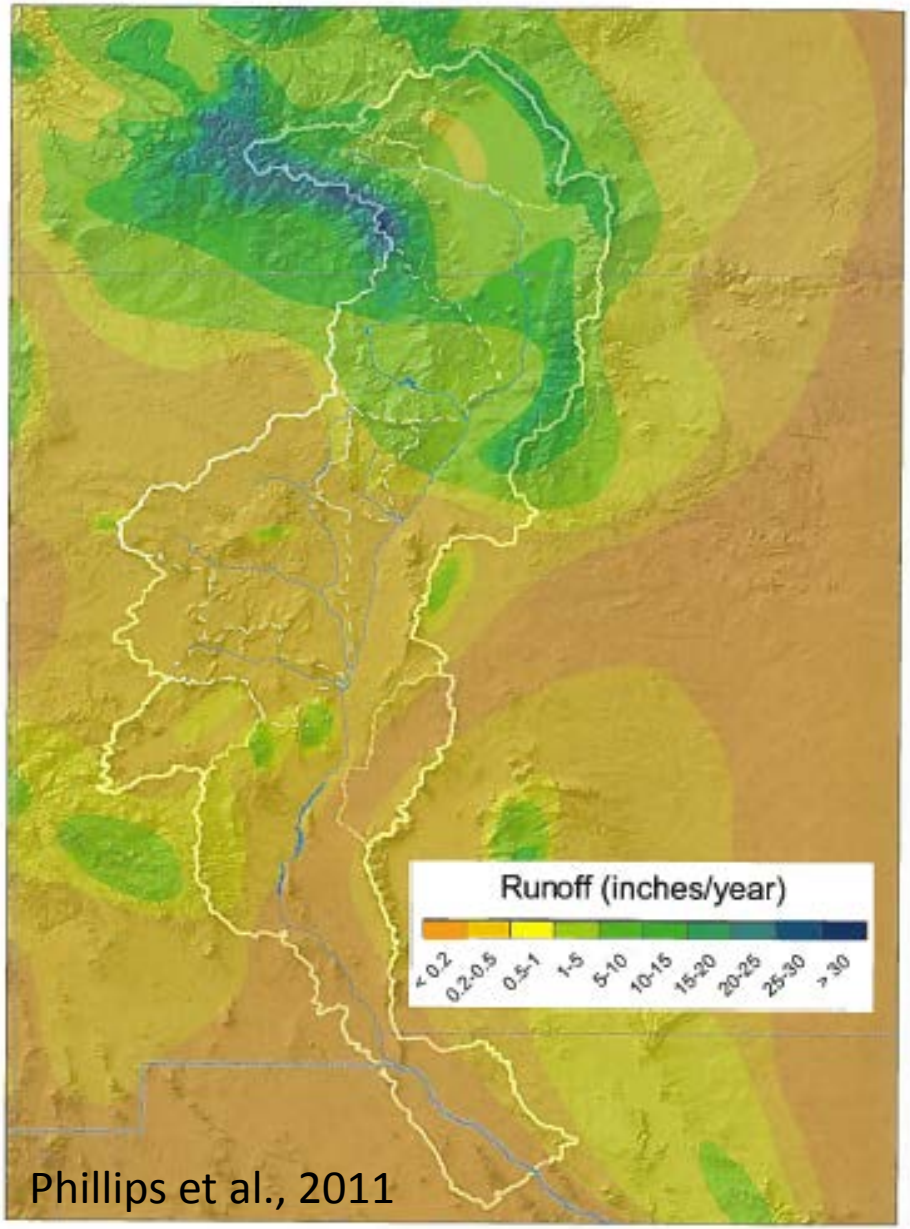
9 – Communications and Accountability

Task 1 – Irrigation District Studies

• Canal lining savings from 47-800 acre feet per mile or 10-30% of water delivered. Lining 10 miles of canal in El Paso would save enough water for 1,000 acres of irrigated crops or 8,000 households.

• Economists and engineers with New Mexico State University collected data on the factors that affect water needs, water-use efficiency, and economic returns from water in Southern New Mexico's Rio Grande Basin. A spreadsheet based on the research reveals excessively long durations of irrigation and frequent over-watering of alfalfa, pecans, and cotton Low flow rates lead to excessively long irrigation durations, which result in over-irrigation.

• Graywater and brackish water show potential for agricultural irrigation



Phillips et al., 2011

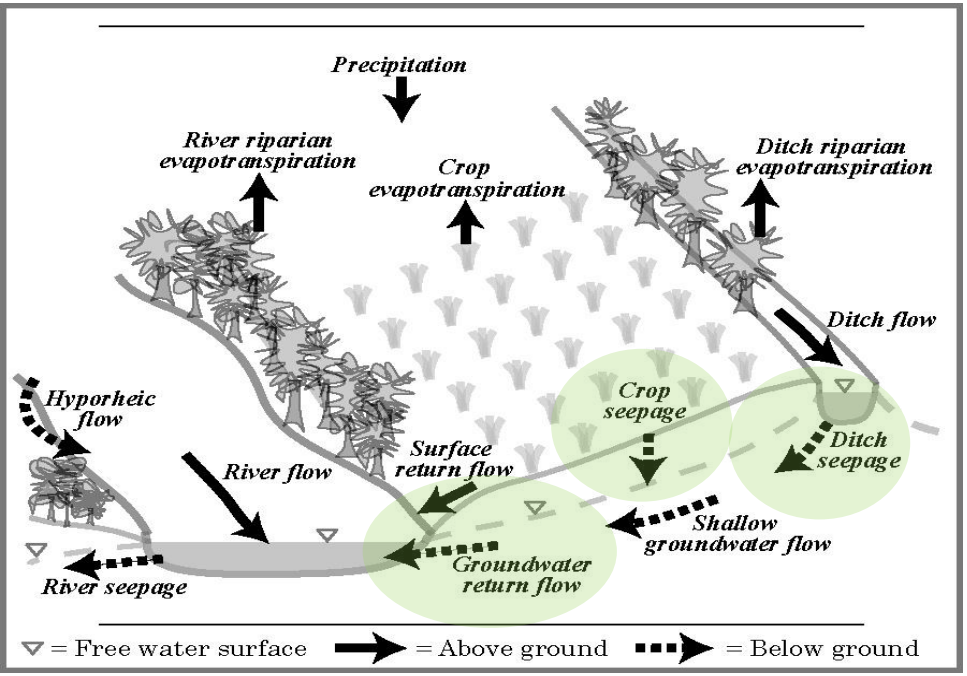
Plate 13
Runoff produced by precipitation over the Rio Grande basin. The units (in/yr) show the amount of precipitation that must run off to supply the flow in the streams draining each portion of the basin. Nearly all of the areas that produce large amounts of runoff are found at the highest elevations, and the monster canal diversions in the San Luis Valley cut off the areas producing the most flow from the rest of the drainage basin. Image courtesy of Matej Durcik and Fred M. Phillips.

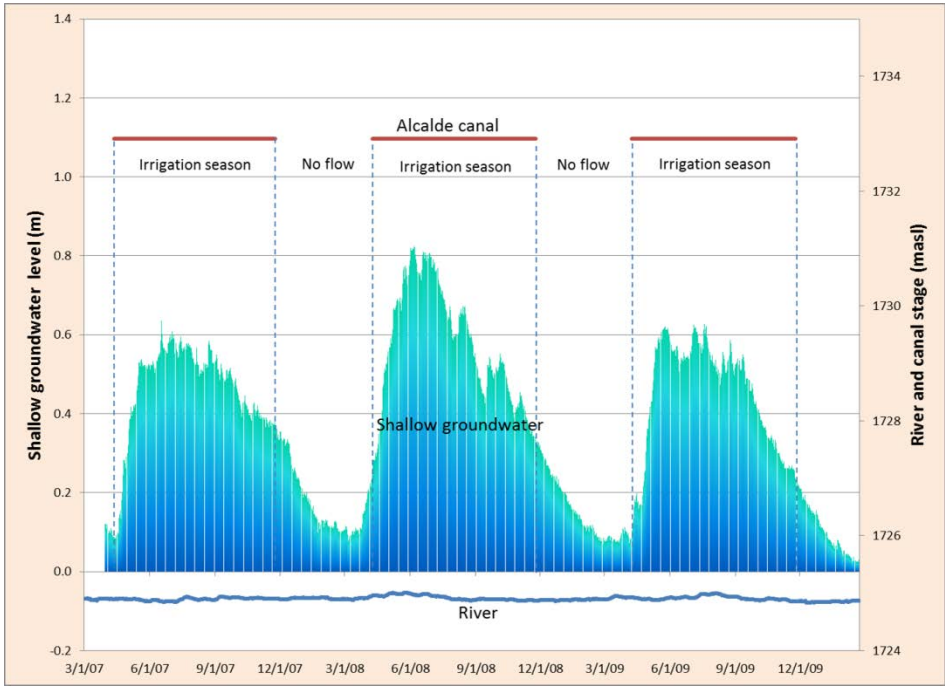
RUNOFF PRODUCTION

Efficiency varies by runoff producing and runoff receiving regions

Task 6 – Environment, ecology, and water quality

- Hydrology study of traditional acequias in northern New Mexico shows benefits of seepage including water quality improvement, riparian habitat support, and increased late season flow to downstream users.





Task 2 – Irrigation education and training

• A project called User Friendly Drip Irrigation and Mulch Systems for Urban Specialty Crop Production aimed at increasing the use of drip irrigation and mulch systems for urban specialty crops has helped New Mexico Master Gardener cooperators to reduce water application by 29.3 percent. Approximately 246 New Mexico master gardeners in 10 county programs were trained in drip irrigation and water conservation techniques.

• "Smart" irrigation controller program operates in nine TX communities for four years including during a historical drought.

Task 3 – Institutional Incentives for Efficient Water Use

• Benefits and impacts of alternative water policies analyzed

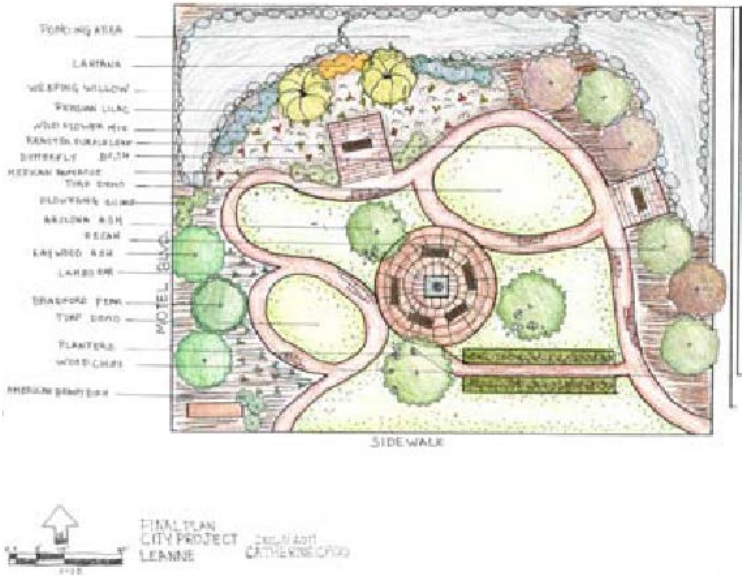
New Mexico State University and Texas A&M AgriLife researchers economists analyzed the benefits and impacts of alternative Rio Grande water management policies using integrated hydrologic, institutional and economic models. Researchers found that, compared to existing rules governing the river system's water use, future drought damages could be reduced by one-fifth to one-third per year with intrastate and interstate water markets.

Task 5 – Urban water conservation

- Rainwater harvesting demonstrations implemented in Hidalgo and Cameron counties – Installed 55 and 2000 gallon tanks.

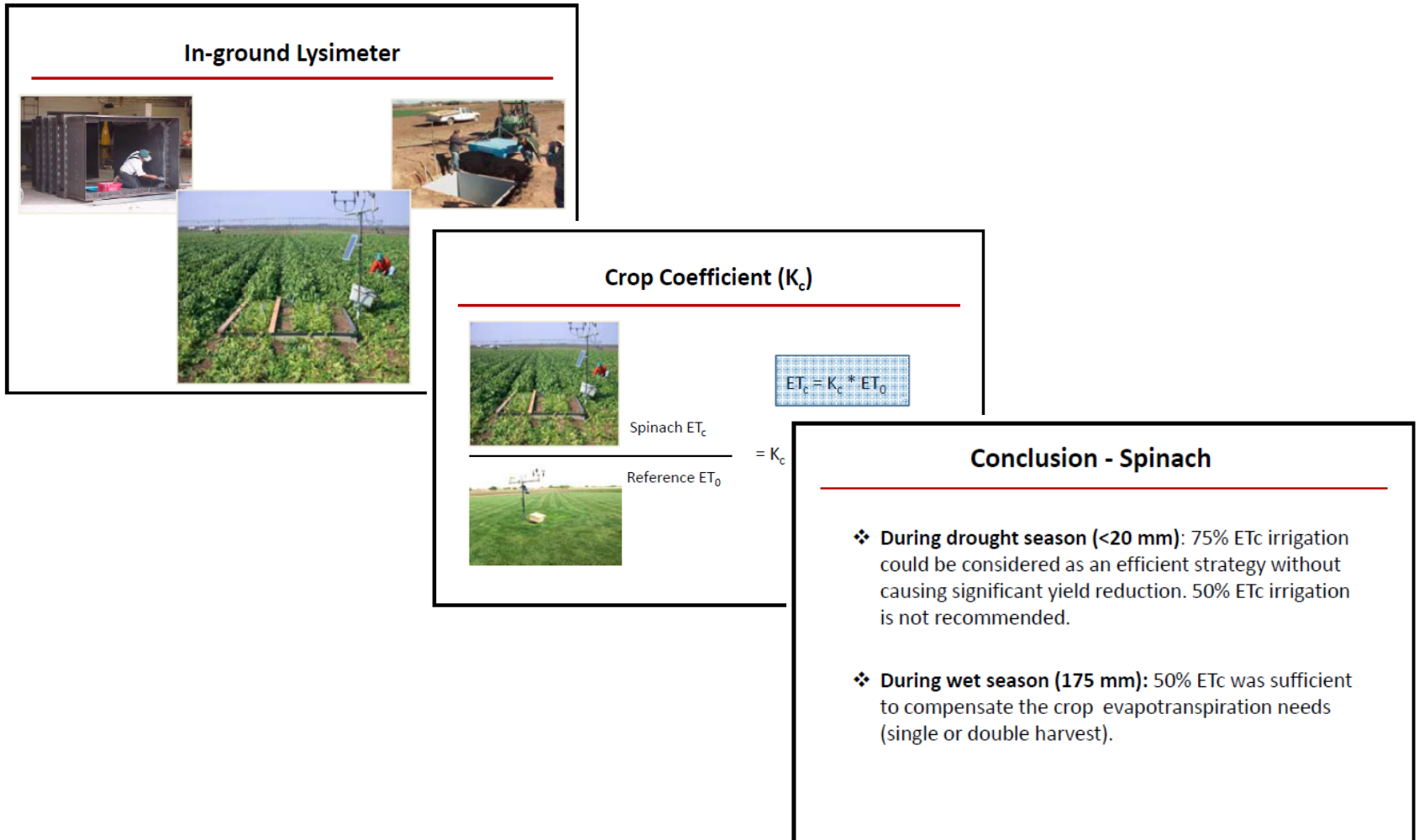
- Herbaceous perennials evaluated for salt tolerance - Plants of the genera *Rudbeckia and Phlox* were the most susceptible to salt damage, even at the lowest salinities, and accumulated the highest levels of Cl in their tissue. Conversely, the genera *Lantana and Cuphea* tolerated extremely well salinities up to 1,700 ppm, provided as sodium and calcium chloride, whereas *Coreopsis was intermediate in its* response.

- Establishing a Virtual Urban Landscape Water Conservation Center in New Mexico



Task 4 – On farm irrigation system management

- Crop water requirements. Preliminary results indicate that crops at several stages yield well with only 75 percent moisture replacement— a 25 percent savings in irrigation water.



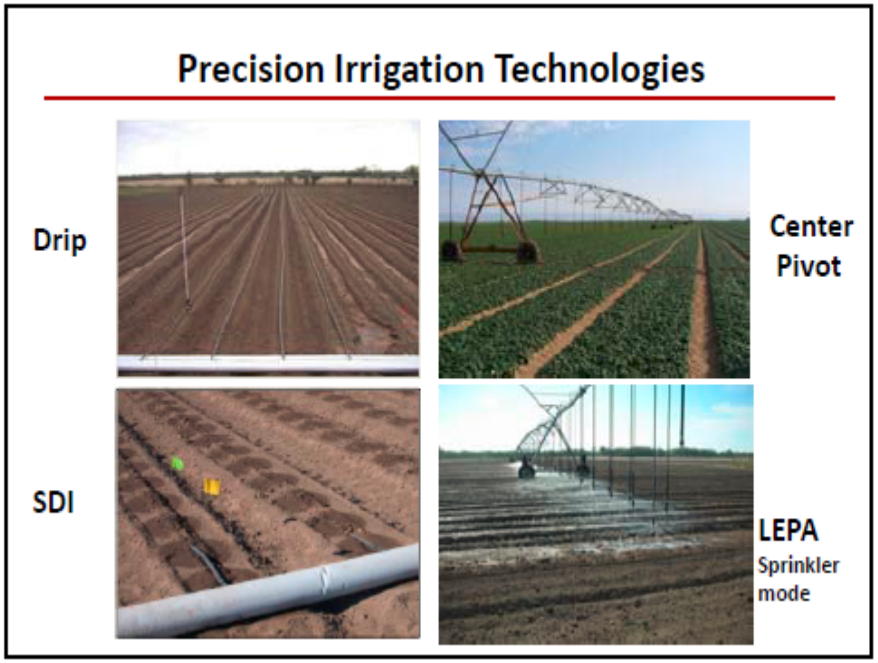
• Pecanigator

Researchers at New Mexico State University have evaluated two affordable evapotranspiration measurement techniques that can possibly be used by pecan producers to increase irrigation efficiency and conserve water

• Evaluation of precision irrigation technologies showed water savings of 6–8 inches per acre per year result in 163,000–217,000 gallons per acre per year or 16.3–21.7 million gallons per “typical” field per year

• Cooperative Extension established a program in New Mexico to assist users in the distribution and conservation of irrigation water with Elephant Butte irrigators, with evaluation of the costs and benefits of a water-metering program

• Irrigation scheduling with the use of soil moisture sensors has allowed Lower Rio Grande farmers to conserve about 10,000 acre-feet of water in corn crop production systems and 25,000 acre-feet of water in cotton crops.



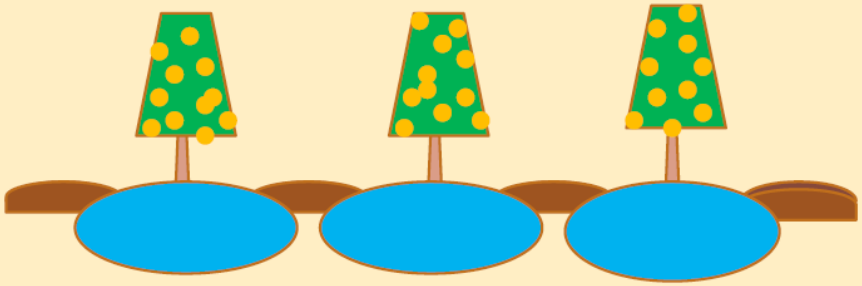
Traditional Flood

vs

Border Flood Irrigation

Microjet Spray Irrigation

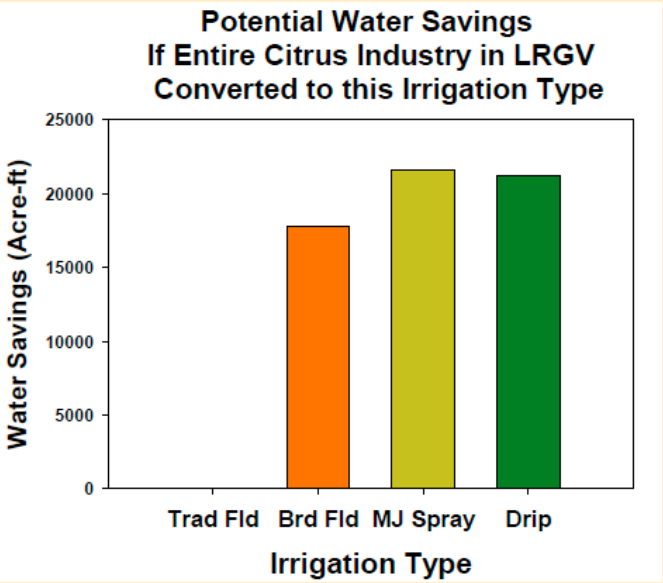
- Some producers use microjet sprinkler systems to irrigate citrus
- Microjet Sprayers are good at targeting water underneath the tree canopy where most feeder roots are located



NBF Irrigation can more adequately target the rootzone of citrus trees, while applying this water at a faster rate to minimizing deep percolation, thus resulting in 50% water saving and retaining fertilizer within the rootzone.

Estimated Annual Water Saving Over Flood

- **If South Texas citrus industry converted to irrigation type: 17,000-21,000 Ac-ft water saved/yr.**



CONCLUSIONS

- Efficiency programs include technology, policy, collaboration
- There is room for expanded efficiency programs
- Efficiency varies by location in basin from upstream to downstream
- Research will pave the way for implementation of programs

FY15 NM WRRI Expansion Request $350,000

An appropriation to NM WRRI will help meet new water challenges by broadening water research opportunities throughout New Mexico.

- **$120,000 New Mexico Faculty Water Research Seed Grants**

At least four research projects per year that confront water scarcity issues will be funded through these seed grants to faculty at NMSU, UNM, and NM Tech.

- **$60,000 University Student Water Research Grants**

Approximately twelve grants will fund student research at NMSU, NM Tech, UNM, ENMU, NMHU, and Northern NMC and provide leverage for securing additional funding. The training of our future water resources research scientists, technicians, and managers is integral to the NM WRRI's mission.

- **$100,000 Water Policy and Research Applications Scientist**

This scientist will apply water research policy studies to help solve drought and water scarcity problems in New Mexico.

- **$70,000 Hydrologic Data Acquisition and Synthesis**

New Mexico is facing water scarcity limits to economic development and community health. Funds will be used to acquire, process, synthesize, and deliver data.

Rio Grande Basin Initiative (RGBI)

Efficient Irrigation for Water Conservation in the Rio Grande Basin

Objectives

- Meet present and future water demands for agricultural, urban and environmental needs
- Expand efficient use of available water
- Reduce water supply delivery losses
- Create new water supplies
- Improve water quality
- Broaden outreach and teaching programs on efficient water use and management
- Help facilitate infrastructure improvements

RGBI Partners

- **Texas Water Resources Institute** (TWRI)
  - Texas A&M AgriLife Research
  - Texas A&M AgriLife Extension Service
- **New Mexico State University** (NMSU)
  - NMSU Agricultural Extension Service
  - NMSU Agricultural Experiment Station
- **USDA, National Institute of Food and Agriculture**