Project Narrative

Name of Project: Equipment for Irrigation Management with Extreme Deficit Water Resources

Geographic Area of the Project: Texas High Plains

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Amount of Funding Requested: $14,000

Project Need, Description and Expected Outcomes

Situation and need for the project:

Declines in groundwater require continued efforts to improve water use efficiency as growers transition to rain fed production on the Texas High Plains. Methods to better manage extremely limited water resources with LEPA, drip and spray delivery systems are being investigated at the TAES facilities at Halfway. This research is conducted with irrigation systems, pipelines, and a water well that are maintained within the current water resources project. Although general research efforts are supported by several sources, funding for upkeep of these major pieces of equipment is limited. In this proposal, I am requesting funds to replace/repair a deep well turbine pump that has been used for the past 23 growing seasons ($7000), to replace an obsolete variable frequency drive controller for a 12-year old pivot ($5000), and to install a radio control safety system that will terminate the water supply when irrigation systems malfunction ($2000). The pump and VR controller are currently in use and have worked well. However, ***mechanical problems with these components during peak irrigation periods could take weeks to repair and, therefore, jeopardize several ongoing research projects***. The installation of a water well safety system would also greatly reduce the risk of over irrigating research plots when unattended irrigation systems stop (safety out). A brief description of current projects utilizing this equipment is given below.

Description and expected outcomes of water resource projects affected by this proposal:

Cotton Irrigation Management For Reduced Surface Losses With Limited Water Resources (supported by Cotton Incorporated)

Experiment 1. Hypothesis - a large portion of preplant irrigation water is lost, even when using the most efficient irrigation delivery systems. Treatments compare *limited* preplant irrigations to *full* preplant irrigations with maximum pumping capacities restricted to 0.1 and 0.2 in./d and irrigation delivery by spray, LEPA, and subsurface drip irrigation (SDI). Expected outcome – documentation of preplant irrigation losses and recommendations to improve preplant irrigation for system proven to be very efficient *during the growing season*, but much less efficient during preplant irrigation periods.

Experiment 2. Hypothesis - low elevation spray applicators under a closed cotton canopy (narrow row spankings which reduce soil surface evaporation losses) would result in cotton lint yields approaching LEPA. Cotton is planted in one, two, and three rows per 40-inch bed and irrigated with spray and LEPA systems to evaluate cotton yield and water use efficiencies. Expected outcome – recommendations for cultural methods that improve spray irrigation efficiency in areas where LEPA is not a feasible irrigation alternative.

High Plains Cropping Systems (supported by PROFIT Initiative)

Experiment 3. Hypothesis – a cotton-cotton-sorghum rotation utilizes available water better than continuous cotton with limited water and efficient delivery systems. Treatments compare rotations to continuous cotton with irrigation capacities restricted to 2.5 gpm/acre and 1.25 gpm/acre, as well as under dryland conditions. Sorghum varieties, populations and planting dates are established to optimize rainfall and LEPA irrigations. Tillage factors will also be introduced. Expected outcome – long-term comparisons of rotations in terms of soil water, yield, and economics using efficient irrigation management of extremely limited water.

Evaluation of Sprinkler-Induced Flower Loss with a Simulated Irrigation System (Unfunded)

Experiment 4. Hypothesis – reductions in lint yield from spray versus LEPA irrigation cotton are *not* primarily due to cotton flowers coming into contact with irrigation water using typical spray applicators. Treatments include "extra" water applications (3 times per week from mid July to mid August) with above canopy spray nozzles, low in-canopy spray nozzles, LEPA, and no-treatment to cotton plants that are heavily irrigated heavily by the LEPA method. The "extra" water applications are applied in small random plots with a 6-row irrigation simulator. Expected outcome –evaluation of commonly used irrigation application devices in terms of boll counts, lint yield, and water use efficiency and recommendations for spray applicator placement to prevent possible flower (and yield) loss.

Specific Issues Addressed

Research within the water resources project at Halfway addresses methods and equipment to reduce water losses in row-crop production agriculture from both rainfall and supplemental irrigation. Recommendations resulting from this research will help sustain the area economy. Specific concerns addressed by this project include:

Water resources – develop methods to reduce water requirements while sustaining yields (all experiments).

Wind erosion – evaluate high residue crop rotations to reduce soil and water losses (experiment 3).

Water management and conservation – develop management recommendations based on pumping capacities and delivery method (all experiments).

Cropping systems and rotations – evaluate nontraditional cropping systems using efficient irrigation methods (experiments 2 and 3).

Conservation practices economics – determine the economic impact of different systems (experiments 1, 2, and 3).

Collaboration

Collaborators include:

Dr. Eduardo Segarra, TAES and TTU, economics professor, economic evaluations of irrigation management and cultural practice scenarios.

Dr. Dana Porter, TAEX and TAES, agricultural engineer, information transfer to county agents, farmers, and crop advisers.

Dr. Calvin Trostle, TAEX, agronomist, support and information transfer for cropping systems experiment.

Submitted by _____
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Approved for submission _____
Dr. Jaroy Moore, Resident Director