Project Narrative

Name of Project: Development and Evaluation of Dual Applicator (LEPA & Spray) Pivots

Geographic Area of the Project: Texas High Plains

Name of Principal Investigator: James P. Bordovsky

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Amount of Funding Requested: $15,000

Project Need, Description and Expected Outcomes

Situation and need for the project:
An estimated 3 million acres of farmland are irrigated by center pivot systems on the Texas High Plains. Of these pivots, fewer than 30% are modified and managed as Low Energy Precision Agriculture (LEPA) irrigation systems (Personal communication, HPUWCD No. 1 and TCE staff). Properly managed LEPA systems have increased crop yields and water use efficiencies over traditional spray systems by 10 to 30 percent (research conducted by Lyle and Bordovsky over the past 20 years). This increase is primarily attributed to reductions in evaporation losses. Reasons that growers use spray pivots rather than the more efficient LEPA systems include 1) the inconvenience of using and maintaining furrow dikes – LEPA requires surface storage of applied water until infiltrated and 2) excessive slope on portions of the area under the pivot limit the use of LEPA – high-intensity rain on circular rows with a 1.5% slope can result in runoff and erosion. The research premise of this proposal is that "hybrid" LEPA /spray irrigation systems can be constructed and programmed to irrigate using the LEPA method in the flat areas of a field (dikes not needed) and be switched to the spray method in sloping areas. This scenario would, thereby, increase the total LEPA irrigated acres on the High Plains and increase irrigation water use efficiency.

Project description:
The project described is a pilot project involving the construction and initial evaluation of a prototype hybrid LEPA/spray (**Dual**) irrigation system. The construction will take place on two sections of an existing center pivot located at the Helms Research Facility at Halfway. Portions of this pivot have already been modified for variable rate (VR) water delivery by the LEPA method. Existing pressure control and pivot positioning controllers used in the VR project will also be used for the **Dual** system. Solenoid valves and irrigation applicator devices will be placed on the outermost section of the pivot (covering 9 acres with the greatest change in topography) and in span 2 (covering 6 acres). Modifications to the applicator controls will be made so that designated "spray" areas will be irrigated at a 2-x or 3-x rate compared to LEPA rates and at intervals that are 2 or 3 times as long as LEPA applications, thus simulating high frequency LEPA irrigations as well as less frequent spray treatments. Spray treatments will take place in all areas regardless of slope and non-diked LEPA treatments will occur in areas of less than 0.5% slope. If sufficient area is available, the standard treatment of LEPA irrigation using furrow dikes on all slopes will be added. Corn (or sorghum) and cotton will be grown. Crop yields and water use efficiencies (WUE) representing the **Dual** system irrigation will be compared to those representing irrigation with the spray and standard LEPA treatments. Yield and WUE projections will be made for the entire pivot based on acquired yield data and pivot topography.

Expected outcomes and benefits:

This project will help determine the possibility of using **Dual** irrigation systems to increase the number of acres irrigated by the LEPA method on the Texas High Plains. Use and proper management of more efficient irrigation systems can help extend the life of available water supplies and maintain economic viability of the High Plains. Increasing water use efficiencies so that irrigation waters might be diverted to other uses continues to be a major issue.

Specific Issues Addressed

This research addresses the issues of water resources, agriculture water management, agricultural water conservation, and irrigation efficiency.

Collaboration

Collaborators include:
Dr. Eduardo Segarra, TAES and TTU, Professor of Economics. As this project continues, Dr. Segarra will perform economic evaluations of irrigation system alternatives and their management.
Dr. Dana Porter, TAEX and TAES, Assistant Professor and Agricultural Engineer. As this project progresses, Dr. Porter will help provide information transfer to county agents, farmers, and crop advisers.

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