

Project Narrative

Name of the Project: **IMPROVING WATER MANAGMENT FOR OPTIMUM CROP PRODUCTIVITY AND PROFITS UNDER SUPPLEMENTAL IRRIGATION.**

Geographic Area of the Project: Water Resources, Water Management and Conservation

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Amount of Funding Requested: \$ 20,000

Project Need, Description and Expected Outcomes

Discuss the situation and need for the project, describe the proposed project and expected outcomes/benefits, and suggest how the proposed project involve the use of innovation and new technology.

Of the 20-million acres in Texas dedicated to field crop production about 6-million acres are irrigated. Unfortunately, the availability of irrigation water does not often satisfy the crop's demand. Instead, many growers use irrigation to supplement the stored soil water accumulated before planting and precipitation received during the growing season. Effective management is based on knowing how to receive maximum benefits from water stored in the soil, received as precipitation during the growing season, and optimizing the timing of irrigation so the water applied achieves the highest crop yield. Achieving this level of management is not easy. It is complicated by erratic precipitation, the spatial variability in the soil water supply, and the progressive nature of crop development and yield formation. Crop simulation models can bridge this information divide by providing an integrated analysis of the site-specific and grower-specific factors influencing the crop. This enables the grower to evaluate the impact of irrigation on crop performance, given the previous and current weather conditions, local soil characteristics, farming practices and crop.

CroPMan (Crop Production Management Model), a Window's version of **EPIC (Environmental Policy Integrated Climate model)**, was developed to help growers minimize their production-related risks to optimize production and maximize profit. **CroPMan's** extensive databases and in-depth treatment of climate, soils, crops, cultural practices, and production related decisions make it an ideal tool to help Texas Growers more effectively manage irrigation for crop production. Although EPIC has been used extensively for environmental impact and agricultural policy analyses, it has seen limited application in crop production-risk management-- particularly in the area of irrigation and water management. Our goal is to evaluate CroPMan's ability to simulate crop water use and yield and strengthen the model's features for managing irrigation where water supplies are limited and energy costs vary widely. Specific objectives focus on the following activities:

1. Evaluate the response of irrigated corn, grain sorghum and cotton in Texas. Compare CroPMan simulated versus measured yields and CroPMan simulated versus measured seasonal evapotranspiration.
2. Develop a software utility to download, format, and append daily weather from High Plains and South Plains PET Networks (Marek, Amarillo; Lascano, Lubbock), the South Texas Weather Network (Fernandez, Corpus Christi), and the Texas ET Network (Fipps, College Station) to **CroPMan** daily weather files.
3. Construct an irrigation cost calculator to estimate the pumping costs (\$/acre) for CroPMan. Add irrigation cost, monthly and daily precipitation, and yearly, monthly, and daily runoff to CroPMan simulated output.

This project strengthens the ongoing cropping system modeling research and outreach efforts of TAES/TAEX , enabling us to improve the simulation capability of **CroPMan** for managing irrigated crops in regions where water limitations, such as the Texas High Plains and South Plains and the Rio Grande Valley. As water supplies become more limiting and costs escalate, growers will need comprehensive models, like CroPMan, to scrutinize irrigation practices and most efficiently utilize their water resources to attain their highest returns. By completing the objectives outlined above, we will expand CroPMan’s capability to assist growers with their irrigation decisions, increase confidence and understanding of the model’s capability to simulate crop response to irrigation, and deliver a more complete irrigation decision aid package to Texas growers and agricultural practitioners.

Specific Issues Addressed

Relative to the needs of current water and/or conservation projects (listed in Section III, or others), what concern(s) is/are addressed by this project?

This project aims to improve resource management and irrigation efficiency by developing and transferring computer simulation technology so that growers and agricultural practitioners can better manage and conserve their water resources.

Collaboration

<u>Collaborator</u>	<u>Agency/Location</u>	<u>Discipline</u>	<u>Function/Role</u>
Dr. Jimmy Williams	TAES, Temple	Ag. Engineer	EPIC Model/Programmer
Dr. Terry Howell	ARS, Amarillo	Ag. Engineer	Model Water/Yield Validation
Dr. Dan Krieg	Texas Tech	Crop Physiologist	Model Water/Yield Validation
Mr. Tom Marek	TAES, Amarillo	Ag. Engineer	Weather Network
Dr. Robert Lascano	TAES, Lubbock	Soil Scientist	Weather Network
Dr. Carlos Fernandez	TAES, Corpus Christi	Crop Physiologist	Weather Network
Dr. Guy Fipps	TAEX, College Station	Ag. Engineer	Weather Network

Submitted by _____
(P.I. signatures)

Approved for submission _____
(Unit Head signature)