

# Efficient Profitable Irrigation in Corn

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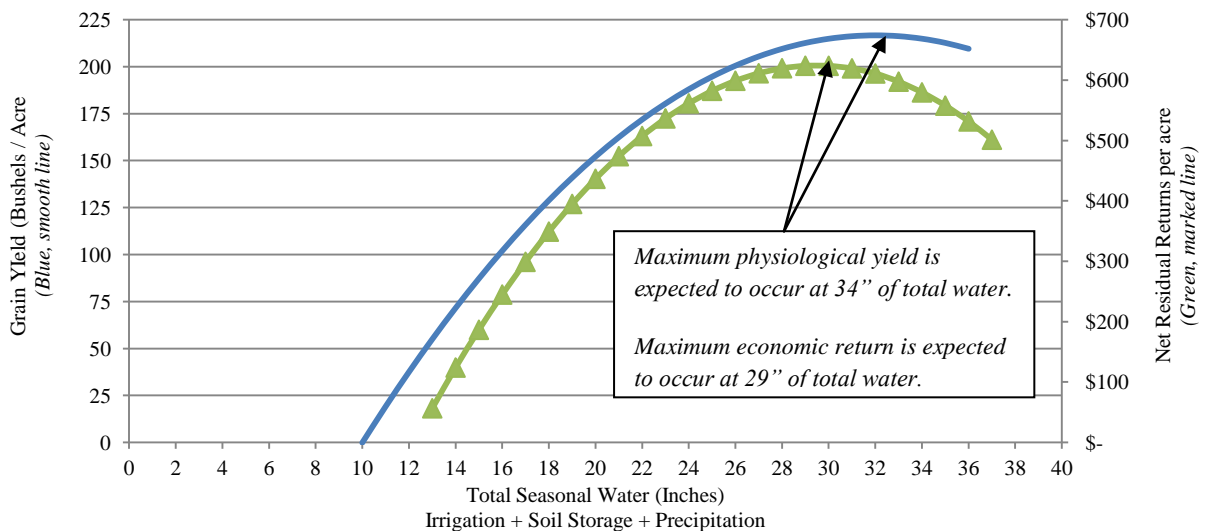
## Introduction

*Efficient Profitable Irrigation in Corn (EPIC)* is a results demonstration effort conducted by the Texas AgriLife Extension Service and funded primarily by the North Plains Groundwater Conservation District. The foundation of EPIC is the principle of managing irrigation water for maximized profitability as a means for making optimal economic and agronomic use of the water resource, namely the Ogallala Aquifer (Figure 2). EPIC targets grain corn producers who historically employ efficient irrigation systems and solid agricultural practices in a production strategy focusing on maximized yields (revenue). EPIC is designed to be a multi-year, staged project that helps high-yield grain corn producers maximize their on-farm production potential and reduce applied irrigation water. Potential regional water savings under partial adoption of this practice is estimated to exceed 37,500 acre-feet or 12 Billion gallons annually.



Figure 1: Late season corn ear from EPIC Plot

Figure 2: *Texas North Plains Grain Corn Production Function* (smooth blue line) and *Net Per-Acre Grain Corn Residual Returns per unit of total Seasonal Water* (marked green line). The production function was developed based on Texas North Plains field and research data including localized Agri-Partners Data. The economic component of this figure is derived from the 2010 *Texas Crop and Livestock Enterprise Budgets – Texas High Plains*, adjusted for \$6.50 per bushel of grain corn retail price and \$5.00 per thousand cubic feet (MCF) natural gas purchase price. This chart is indicative of the 2011 production season, based on 2-inches of in-season precipitation, 4-inches of available soil water, and 20% heat-related yield reduction.



## Project Methodology

EPIC's in-field, scientific approach utilized two side-by-side field plots (separate fields or split fields), maintaining one plot as a control and management of irrigation on the experimental plot to meet two objectives; 1) maintain or improve yield as compared to the control and 2) reduce pumped irrigation water by one to four inches. In the inaugural season, 2011, five (5) irrigated producers in the Texas North Plains became EPIC cooperators, contributing field-scale control and experimental plots, all farm operations, and all production costs with no monetary compensation from EPIC. The EPIC

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project provided Pivotrac monitoring (where applicable) with producer access and AquaSpy soil probes and AquaPlanner crop modeling without producer access in order to maintain the validity of the control plot. The control plot was titled the “Legacy” plot and was managed according to the specific producer’s standard practice and the “EPIC” plot was managed with Texas AgriLife inputs based on best management practices and information from management tools.

### Summarized Results

The preliminary 2011 EPIC results are tabulated below (Figure 3). In four of the five cooperator plots grain corn yields were maintained and increased with a corresponding reduction in irrigation water applied. It is important to note that the design and scope of this project did not include on-site replication and the results were obtained primarily for the purpose of demonstrating a scientifically sound approach to managing water. Although very compelling, the results should be viewed anecdotally as local examples rather than conclusive scientific evidence.

Figure 3: 2011 North Plains EPIC field results. Control plots are labeled “Legacy” and experimental plots are labeled “EPIC”.

Location	Plot	Water (Inches)				Yield (Bu/ Acre)	WUE <sup>4</sup>
		Irrigation	Soil <sup>3</sup>	Precipitation	Total		
Dallam Co. <sup>1</sup>	Legacy	29.1	2.71	0.97	32.8	207.5	6.3
Hartley Co.	Legacy	34.6	0.12	1.97	36.7	241.0	6.6
	EPIC	31.4	(0.35)	1.97	33.1	241.0	7.3
Hutchinson Co. <sup>2</sup>	Legacy	20.0	4.32	2.57	26.9	180.1	6.7
	EPIC	17.4	3.10	2.57	23.1	190.2	8.2
Ochiltree Co.	Legacy	31.2	(0.66)	2.30	32.8	168.0	5.1
	EPIC	30.0	0.39	2.30	32.6	188.0	5.8
Sherman Co.	Legacy	28.6	4.40	2.11	35.1	140.8	4.0
	EPIC	25.6	2.12	1.67	29.4	171.0	5.8

<sup>1</sup> Irrigation application was not able to be reduced on the Dallam County field due to the severe 2011 weather conditions.

<sup>2</sup> The Hutchinson County plots utilized subsurface drip irrigation (SDI). The Legacy plot (10.25-acres) reached physiologically maturity earlier than the EPIC plot (11.6-acres) and the remainder of the field (total of approximately 65-acres). The field average yield was 184-bushels, including the two test plots.

<sup>3</sup> Soil water content was measured early and late in the season using gravimetric sampling, except the Dallam field which is modeled by AquaPlanner. Negative values indicate seasonal soil moisture accumulation and were evidenced in multiple fields due to dry residual early soil conditions.

<sup>4</sup> WUE refers to water use efficiency defined as bushels of corn per inch of TOTAL water (bu/ inch)

Early season indications and project concept promotion was accomplished through conducting four specified corn irrigation field days during August, conducted in Morse, Perryton, Etter, and Dalhart, Texas on August 19, 24, 25, and 26, respectively. The total recorded audience during these meetings was *166 people*. Additionally, up to five continuing education units were offered at each venue.

### Continuation of EPIC

From the preliminary results from one year of the EPIC project, the implication is that grain corn yields can be maintained or increased with a reduction in applied irrigation water. To further mature this concept and verify the 2011 results, it is recommended that EPIC is continued for at least three additional seasons (through 2014). The operational recommendation is that producers who have participated in one season of blind technology utilization are advanced to full exposure of the management tools with appropriate training. New cooperators would still be expected to participate in one season of blind participation to ensure a control. This component of EPIC proved absolutely essential from a human nature standpoint as multiple cooperators admitted desire to alter the management of their Legacy plot to match the EPIC strategy. Future iterations should include one producer from each of the eight North Plains Groundwater Conservation District counties. Adoption of the EPIC pattern should be considered by other Texas grain corn production regions to demonstrate an additional method of economic, water conservation.

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