FARM Assistance Focus

Texas A&M AgriLife Extension

TAWC
Texas Alliance for Water Conservation

Economic Advantages of Soil Moisture Probes on the Texas Southern High Plains

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Strategic irrigation management will help ensure that producers are irrigating at the right place and at the right time.

Abstract

As water resources become more scarce throughout the Southern High Plains, farmers will need to find alternative management methods to achieve profitability. Strategic irrigation management will help ensure producers are irrigating at the right place and right time. Soil moisture probes can be a valuable tool that can help producers manage their irrigation more efficiently, but the cost of the technology may not be economically profitable and the actual water savings are unknown. This analysis uses a case study to quantify the amount of water savings and the economic impacts of using soil moisture probes to manage irrigation.

Introduction

Since 2005, the Texas Alliance for Water Conservation (TAWC) has worked directly with producers in over nine counties in the Southern High Plains to demonstrate available technologies and management practices to support water conservation efforts. There are over 26 demonstration sites that cover over 5,000 acres representing monoculture, multi-crop, and integrated crop-livestock systems. Producers in the TAWC are provided with soil moisture probes to assist them with their irrigation management. The case study farm used in this analysis is not part of the TAWC project, but it shows the influence that TAWC has had within the region.

The objective of this project is to determine the amount of water savings and quantify the economic advantages of using soil moisture probes on a 125-acre drip irrigated cotton farm near Lubbock, Texas.

Methods

Budget data will be used from TAWC along with soil moisture probe data to analyze the timing and amount of irrigation water applied. An analysis of the potential water savings from a 10-year simulation using the FARM Assistance model will determine the projected long-term water savings. The amount of water saved will be calculated in addition to the cost savings from not pumping. Profitability calculations will include the cost of the moisture probe and the cost of the probe subscription and installation.

The site used in this analysis consisted of a 125-acre cotton farm using a sub-surface drip system with a total well capacity of 450 gallons per minute. The total irrigation season is assumed to be 65 days, however, only 55 days were irrigated. Crop yield averaged 1,675/acre with 10.5 inches of applied irrigation and 9.3 inches of in-season rainfall.

Table 1: Site Information	
Well Yield	450 GPM
Days in Irrigation Season	65
Days Irrigated	55
Pumping Cost	$13.25/ac
Cost to Probe	$700
Subscription	$595
Insallation	$250
In-Season Rainfall	9.3 inches
Applied Irrigation	10.5 inches
Crop Yield	1,675 lb/ac

Results

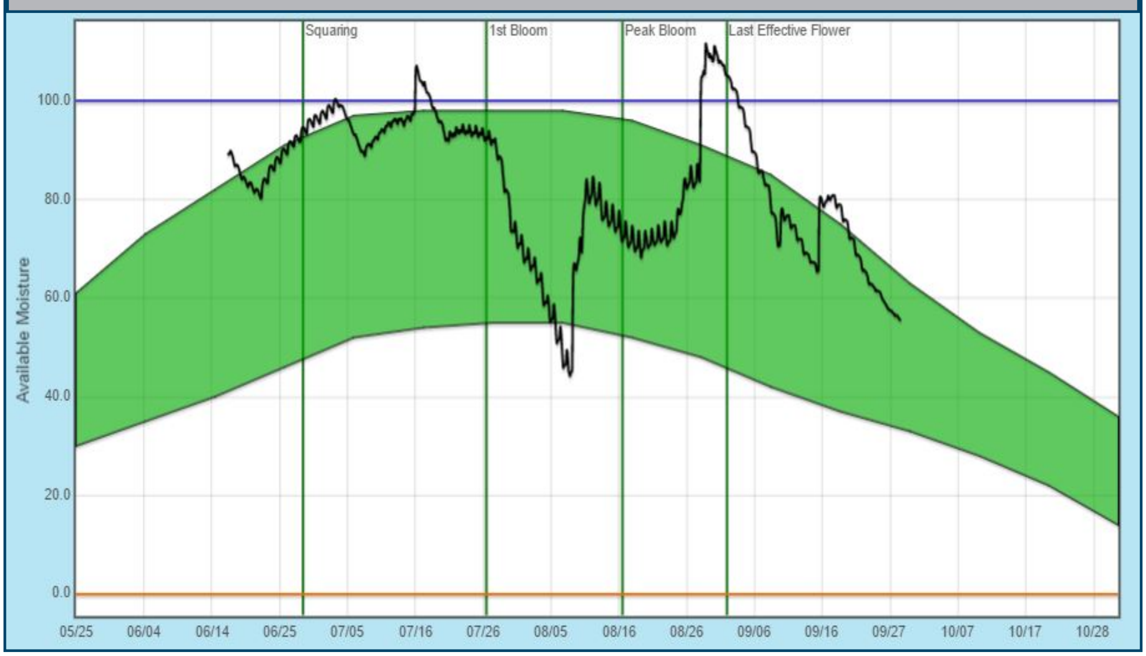
The projected 10-year water savings is shown in Table 2. The water savings were determined to be 6,480,000 gallons for the entire 125-acre field, or 238.63 total acre inches per year. The projected 10-year water savings is expected to be 2,386.3-acre inches, assuming identical rainfall and weather conditions.

Table 2. Irrigation Cost (Fuel)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Change	-	0%	7.87%	8.60%	9.12%	10.20%	7.43%	2.80%	2.72%	2.69%	2.69%
Savings	$1,616.96	$2,316.96	$2,499.30	$2,714.24	$2,961.78	$3,263.89	$3,506.39	$3,604.57	$3,702.62	$3,802.22	$3,904.50
	Total Savings		**$32,276.47**								
	Avg. Yearly Savings		**$ 3,227.65**								

Pumping costs were estimated to be $13.25 per acre. Table 1 provides a description of probe costs, irrigation costs and rainfall information for this site. Based on this information, the total water savings for 2016 is $3,162. The rate of change for irrigation fuel cost was obtained from the Food and Agricultural Policy Research Institute (FAPRI) 2017-2026 baseline projection released in August 2016. In 2017, the cost of the probe ($700), the installation fee ($250), and the software description fee ($595) were all included in the cost of the probe. The total year cost was $1,545. For this analysis, the useful life for the probe is expected to be 10 years. For the 2017-2026 crop years, only the installation fee and the software subscription fee were included, resulting in a total probe cost each year of $845.

Soil Moisture Output



The graph shows a summary of soil moisture levels beginning at the four-inch depth and extending to the 40-inch depth. Readings began in early June and conclude in early October. The green area represents the optimum soil moisture levels to maintain the cotton plant at its peak irrigation level without pushing moisture out of the bottom of the soil profile or to the surface where evaporation can occur. Each small step represents an irrigation event, while larger steps indicate a rainfall event. During the first bloom section in Figure 1., near the beginning of August one of the wells was in repair, resulting in a temporary decline in available moisture. A rainfall event shortly after restored the available moisture to the optimum level for much of the remaining growing season.

Conclusions

This study indicated that a producer can achieve cost savings from reduced pumping costs of $25.29 per acre in year one and total savings over the 10-year period of $32,276 on a 125-acre farm by utilizing soil moisture probes. Water savings amounted to 1.91-acre inches per acre each year and a total savings of 19.1-acre inches per acre over the 10-year study period by irrigating using the data provided by the soil moisture probe.

Based on this study, as water resources continue to decline and profit margins remain tight, producers in the Southern High Plains can utilize soil moisture probes to help better manage their irrigation, resulting in water savings, reduced input costs and increased profitability.