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

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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 that producers are irrigating at the right place and at the right time. Soil moisture probes can be an invaluable tool that can help producers know when to irrigate, but the cost of the technology may not be economically profitable and the actual water savings are unknown.

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 technologies and management practices to support water conservation efforts. There are over 30 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 requirements. The study farm is not a part of the TAWC project , but it shows the influence that the TAWC has had within the region.

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

Methods

Budget data will be used from the TAWC along with 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 reduction in cost savings from not pumping. Profitability calculations will include the cost of the moisture probes and the cost of the probe subscription.

Data

The site used in this analysis consisted of a 125-acre cotton farm irrigated 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 actually irrigated. Crop yield averaged 1,675 lb/acre with 10.5 inches of applied irrigation and 9.3 inches of in-season rainfall. Pumping costs were estimated to be $13.25 per acre. Table 1. provides a description of the site.

Table 1. Site Information

Well Yield	450 GPM
Days in Irrigation Season	65
Days Irrigated	55
Pumping Cost	$13.25/ac
Cost of Probe	$700
Subscription	$595
Installation	$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 was determined to be 6,480,000 gallons for the entire 125 acre field, or 238.63 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.

Based on a pumping cost $13.25 per acre inch, total water savings for 2016 is $3,161.96. 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 subscription fee ($595) were all included in the cost of the probe. The total cost for year one was $1,545. For 2018-2026, only the installation fee and the software subscription fee were included, resulting in a total probe cost of $845.

The graph below 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 bar 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.

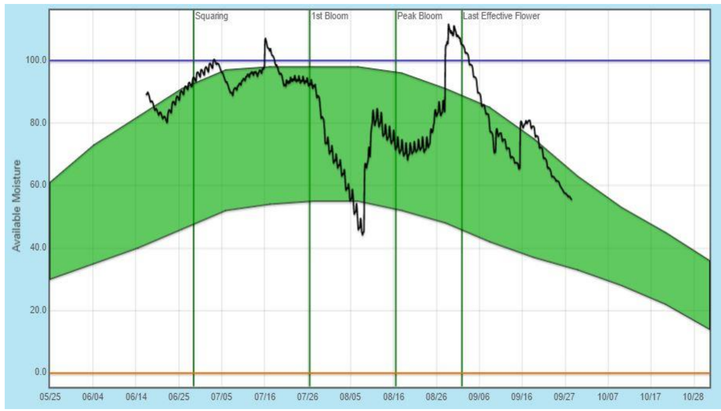

Figure 1. Soil Moisture output

Conclusions

This study shows that savings of pumping costs amounted to $25.29 per acre in year one and savings over the 10 year period being $32,276.47. Water savings amounted to 1.91 acre inches per acre each year and savings of 19.1 acre inches over the 10 year period by irrigating using data provided by the soil moisture probe.

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