Knowing How Much Water You Have Could Mean Higher Profits

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Across the semi-arid Texas High Plains, irrigation contributes significantly to the economic viability of agricultural producers and the regional agricultural economy. The Ogallala Aquifer provides irrigation water to 3.5 million acres of cropland across the region. Within the commercial agriculture industry, the proper management of inputs is crucial to the economic viability of farming operations. Many basic inputs such as seed, fertilizer, and chemicals continue to increase in costs, forcing producers to use more precise application techniques such as variable rate application, GPS, and yield monitoring to allow them the make informed production and input application decisions to maximize profit.

Interestingly, as important as irrigation is in the Texas High Plains, the use of metering technology to monitor irrigation water application has been limited. It is becoming increasingly important to manage irrigation water applications due to the fact that the Ogallala Aquifer is being depleted and water regulation is being considered. Like other production inputs, irrigation water can be better managed through the use of technology to help producers make more informed decisions about irrigation application. Much like the GPS systems that reduce overlap in the application of chemicals, water meters could allow irrigated producers to better match inputs such as fertilizer and chemicals with irrigation system capabilities. If these inputs are better matched with irrigation levels, producers could see an economic benefit from better management of their irrigation water.

To illustrate this possibility, a hypothetical irrigated cotton farm is used to show the potential economic gains that can be achieved through metering water at the irrigation delivery system. There is often a strong correlation between the quantity of water applied and the level of primary inputs such as fertilizer, seed, and chemicals. Matching water availability, yield goals, and production inputs is essential to the success of an irrigated farming operation.

Before discussing the potential economic gains, some assumptions must be made to allow for the comparison of a farm with and without a water meter installed. First, and most important, it is assumed that all production aspects outside of water, fertilizer, seed, and chemical application remain constant. Additionally, any reduction in input use which better matches the levels of input applied to available water will not reduce yield from the level that was being realized before making the input adjustment. The irrigated cotton farm (planted with a Roundup Ready variety) consists of 120 acres with a center pivot irrigation system that is assumed to run 2000 hours during the pumping season. It is believed by the producer operating the farm that the delivery system has a capacity of 325 gallons per minute (the initial rated capacity when the system was installed). Also it is assumed that there is a base quantity of seed, chemicals, and fertilizer used without irrigation (dryland cotton). The amount of these inputs is assumed to increase in a linear relationship as water availability increases. In this manner, we can calculate the cost of inputs per acre inch of water as seen in the Figure 1. As water use declines, the cost (quantity) of other inputs declines as well along an assumed straight line relationship.

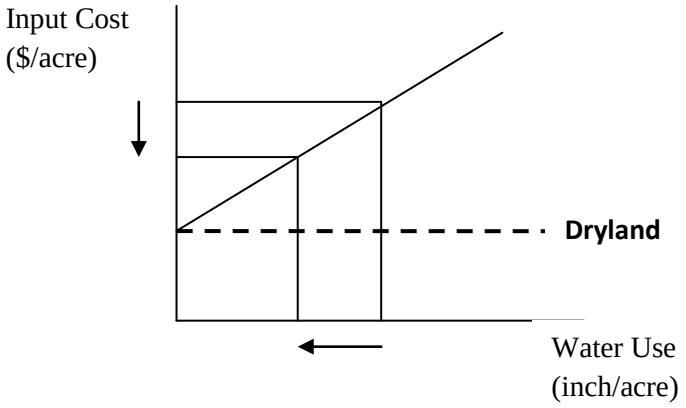

Figure 1. Relationship of input costs and water use.

As illustrated in Table 1, after the producer installs a water meter at the delivery system, he realizes that instead of having 325 gpm there is only 275 gpm available to his field. This is only a difference of 50 gpm, which is not outside of a reasonable magnitude of error for an unmetered well. This translates to a realized pumping capacity of 18% less than expected, reducing the irrigation availability from 12 to 10.2 inches per acre. This number does not seem like a tremendous drop in irrigation capacity; however, if fertilizer, chemical and seed inputs are adjusted to the level of water actually available, the savings could be significant.

Table 1. Differences between Assumed and Actual Irrigation Information

	Before Meter
Assumed GPM	325
Assumed Irrigation Capacity (inch/acre)	12
	After Meter
Measured GPM	275
Actual Irrigation Capacity (inch/acre)	10.2
% difference between assumed and actual GPM	-18.2
Difference between assumed and actual irrigation water applied (inches)	1.8

For this example, the cost of fertilizer, chemicals, and seed were obtained from the Projected 2009 Texas Agrilife Extension Crop Budgets for District 2 for dryland and irrigated cotton. The values shown in Table 2 under the "Without a Meter" scenario represent the additional cost for each input between dryland cotton and center pivot irrigated cotton. Hence, under irrigation there is an additional $31.00 per acre typically spent on fertilizer, $6.00 per acre on chemicals, and $24.04 per acre on seed. Assuming a linear relationship between the total costs of these

inputs over the assumed 12 inches of water applied, the producer is applying $5.08 for fertilizer, chemicals, and seed for each inch of water applied per acre.

Table 2. Additional Cost of Inputs over Dryland, Before and After a Water Meter

Input	Unit	Without a Meter Assumed Irrigation level of 12 inches / acre	With a Meter Actual Irrigation level of 10.2 inches/acre
Fertilizer	$/acre	31.00	26.31
Chemicals	$/acre	6.00	5.09
Seed	$/acre	24.00	20.37
Total	$/acre	61.00	51.77

Potential Savings from Installing Water Meter

Savings $/acre	$/acre	9.23
Total Farm Savings (120 acres)	$	1107.60

With the installation of a water meter, this hypothetical producer realized that his irrigation capacity was 1.8 inches lower than expected. If the goal is to match inputs to maximize yield potential, the producer may be over applying several inputs. Thus, there is the potential to reduce inputs by a factor of 1.8 at $5.08 per acre resulting in a reduction in cost of $9.23 per acre. These costs have been weighted by input category under the "without" scenario in the previous table to illustrate how the total inputs could be reduced from $61.00 to $51.77 per acre when moving from an unmetered 12-inch scenario to a metered 10.2-inch scenario. If input adjustment is applied over the entire 120 acres, the producer could realize a savings of $1,107.60. With typical costs of water meters ranging from $800-$1,000, the investment would pay for itself in one growing season. Additionally, NRCS had proposed a cost share program for water meters in 2010, contact your local NRCS agent for more information.

This example illustrates how utilizing a water meter can be an economic benefit for an irrigated agricultural producer. It is certainly true that not all producers will fall under this same scenario and may see smaller or greater benefits depending on a variety of factors not considered here. However, it can be concluded that even on a single farm a water meter could be a wise investment with the potential to increase net returns over several years. Additionally, as a result of better matching key inputs with water availability, it is possible that the yield could increase, adding further economic gain to the producer. Further, in this example, soil and water conditions could improve through reduced nitrate leaching as a result of lowering the fertilizer application rates. This simple technology could be used by irrigated producers across the Southern High Plains to become more efficient, more profitable, and more informed in their everyday production decisions.

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References:

Texas Agrilife Extension Crop and Livestock Budgets
http://agecoext.tamu.edu/resources/crop-livestock-budgets/by-district/district-2/2009.html