



FARM Assistance

Focus

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Texas A&M System

Furrow, Pivot, and SDI Irrigation Illustration For Cotton in the Southern High Plains

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Conservation of the Ogallala Aquifer, the primary source for water in the Southern High Plains, is being headlined because of substantial depletion of underground reserves. The increasing regional demand for water coupled with the ongoing needs of irrigated agriculture has spurred an interest in evaluating water conservation practices. As a result, water use demonstrations on irrigated crops have been established. In this illustration three irrigation methods are examined: traditional furrow, center pivot, and subsurface drip. Illustrating the economic viability of the site demonstrations allows for an evaluation of the viability of differing irrigation practices in the search for more efficient water delivery systems.

The Texas Alliance of Water Conservation (TAWC) project is a multi-faceted effort among the Texas Water Development Board, Texas Tech University, Texas AgriLife Extension Service, Texas AgriLife Research, the United States Department of Agriculture, the High Plains Underground Water Conservation District #1,

and the producers of Floyd and Hale counties. It is designed to demonstrate water conservation methods while maintaining or improving agricultural production and economic opportunities within communities. The project focuses on maximizing the efficiency of irrigation water pumped from Ogallala Aquifer, while also looking at methods which allow for water conservation with a minimum economic impact to producers. The Texas AgriLife Extension Service (Extension) conducts the economic analyses of demonstration results, evaluating the potential impact of adopting alternative water conserving technologies. Extension works individually with agricultural producers using the Financial And Risk Management (FARM) Assistance financial planning model to analyze the impact and cost-effectiveness of the alternative irrigation technologies.

In 2007, furrow, center pivot, and subsurface drip irrigation (SDI) demonstrations, in association with the TAWC project were examined to

illustrate potential water application and irrigation costs scenarios in cotton production (Table 1). The following analysis evaluates the potential financial incentives for using these three irrigation technologies.

Assumptions

Table 1 provides the basic water use and irrigation cost assumptions for cotton irrigation. For the purpose of illustrating the different technologies, three demonstration sites were used, including a 135.1-acre SDI site (Site 1), a 124.2-acre pivot site (Site 14), and 66.7-acre furrow site (Site 15). Production costs were derived from custom rates and estimates of per acre overhead charges from the three individual sites. They are assumed to be typical for the region and were not changed for analysis purposes. These assumptions are intended to make the illustration relevant to a wide range of producers in the Southern High Plains area.

The analysis consists of three separate demonstration sites located in close proximity to one

Demo Site	Irrigation Method	Acres	Acre Inches Applied	Irrigation Costs per Acre	Irrigation Costs Per Acre Inch	Yields per Acre (lbs.)	Yields Per Acre Inch (lbs.)
1	SDI	135.10	14.64	\$191.97	\$13.11	1374	93.85
14	Pivot	124.20	8.63	\$102.50	\$11.88	1296	150.17
15	furrow	66.70	13.33	\$131.52	\$9.87	1392	104.43

Demo Site	Irrigation Method	Projected Yield 2008-16	10 - Year Averages Per Year				
			Total Cash Receipts	Total Cash Costs	Net Cash Farm Income	Prob Net Cash Income <0 (%)	Avg. Annual Operating Expenses/Receipts
1	SDI	1390	\$1,133.00	\$1,111.00	\$22.00	52.6	0.98
14	Pivot	1000	\$1,047.00	\$921.00	\$126.00	47.3	0.88
15	Furrow	900	\$821.00	\$993.00	-\$172.00	79.5	1.21

another. No difference in soil types, rainfall and management practices were associated within these three sites. As a result, the three trials represent a relatively controlled experiment for comparison purposes. This comparison is a case study example illustrating results of these sites. Site 1 assumes an overhead irrigation cost of \$75.00/acre/year for the SDI, site 14 has a cost of \$33.60/acre/year for the center pivot, and site 15 has a cost of \$25/acre/year for its system. The system cost for the SDI site is assumed to have been installed using the EQIP cost share program, which is a standard practice in the study area. For the current analysis, no other major differences were assumed for the sites.

For each 10-year outlook projection, commodity price trends follow projections provided by the Food and Agricultural Policy Research Institute (FAPRI, at the University of Missouri) with costs adjusted for inflation over the planning horizon. Demonstration

findings suggest a range of possible yields based on varying management practices and production conditions. Each 10-year outlook includes this yield risk as well a price risk.

Results

Irrigation costs and yields per acre inch for 2007 are compared in Table 1. These results show that the costs for the SDI (Site 1) were \$13.11 per acre inch, including the system cost, as compared to \$11.88 per acre inch for the pivot (Site 14) and \$9.87 per acre inch for the furrow irrigated (Site 15). Yields were 93.85 pounds per acre inch for the SDI (Site 1), 150.17 pounds per acre inch for the pivot (Site 14), and 104.43 pounds per acre inch for the furrow site (Site 15).

Comprehensive projections for 2007, including price and yield risk for each irrigation method, are illustrated in Table 2 and Figures 1-3. Table 2 presents the average outcomes for selected financial projections, while the graphical presentations

illustrate the full range of possibilities for net cash farm income. Cash receipts average \$1,133/acre for the SDI (Site 1), \$1,047/acre for the pivot (Site 14), and \$821/acre for furrow (Site 15) over the 10-year period. While 2007 produced unusually good yields, the long-term expectations for furrow irrigated yields remain the lowest of the three irrigation systems. Average cash costs range from \$1,111/acre for the SDI (Site 1) to \$921/acre for the pivot (Site 14) to \$993/acre for the furrow (Site 15). It should also be noted that no direct or counter cyclical payments are included for any of the sites.

Average Net Cash Farm Income (NCFI) is the highest for the pivot (Site 14) at \$126/acre, the SDI site is next at \$22/acre, and is lowest for the furrow (Site 15) is -\$172/acre (Table 2; Figures 1-3). NCFI decreases for all three sites from 2007 to 2008 due to a sharp rise in fuel and fertilizer costs. NCFI then generally increases the remainder of the ten-year projection period for the SDI and pivot sites. All three scenarios reflect significant

levels of risk (Figures 1-3). Risk projections also indicate a 52.6% or less chance of a negative NCFI for Site 1, compared to 47.3% for Site 14 and 79.5% for Site 15 (Table 2).

Summary

The case study results of comparing irrigation methods for cotton illustrate a variation of possible water application rates and irrigation costs. Two of the system demonstrations reported here, SDI (Site 1) and the Pivot (Site 14), illustrate a profitable use of modern technology in irrigation cotton production. However, the furrow site (Site 15) reflects a net loss per acre with furrow irrigation. It is important to note that the advantages and disadvantages of various irrigation systems will vary by crops, soil types, and seasons.

Figure 2. Projected Variability in Net Cash Farm Income per Acre for Cotton, Pivot.

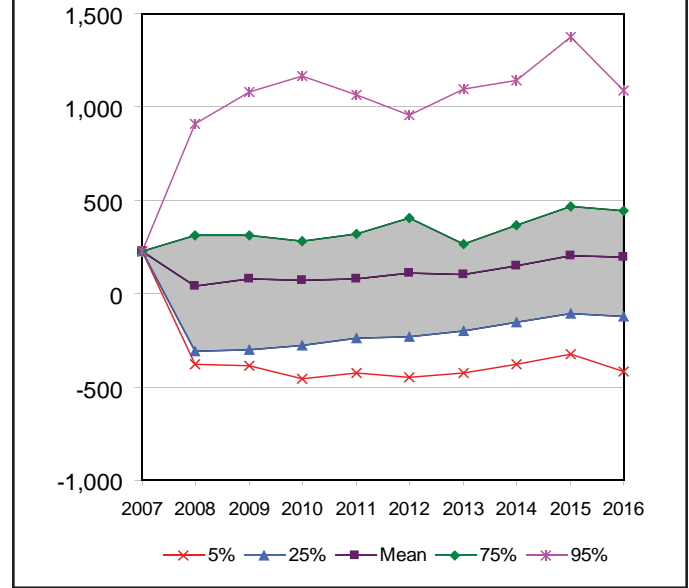


Figure 1. Projected Variability in Net Cash Farm Income per Acre for Cotton, SDI.

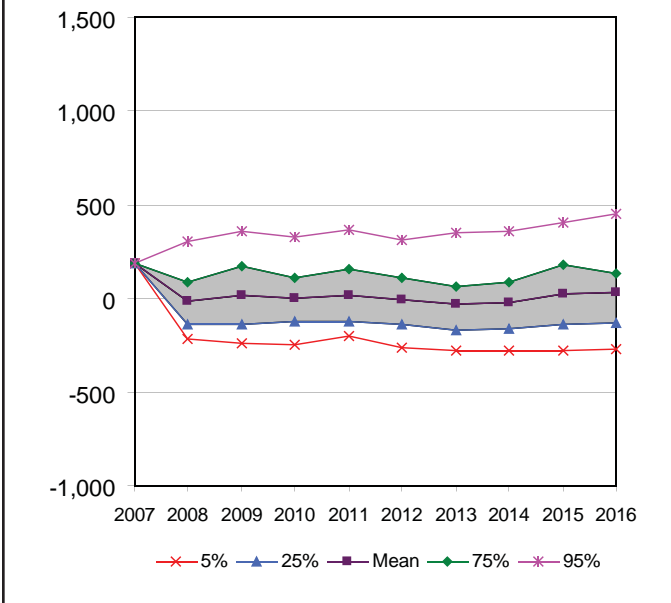


Figure 3. Projected Variability in Net Cash Farm Income per Acre for Cotton, Flood .

