



# FARM Assistance

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## Pivot vs. SDI Irrigation Illustration for Side Oats Grama in the Southern High Plains

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FARM Assistance Focus 2009-2  
January 2009

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*An increasing regional demand for water coupled with the ongoing needs of irrigated agriculture has spurred an interest in evaluating water conservation practices.*

The overall demand for water in the Southern High Plains is being pressured by a substantial depletion of underground reserves. An 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, such as subsurface drip irrigation and pivot irrigation have been established. 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 the 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, center pivot irrigation technology was compared to subsurface drip irrigation (SDI) demonstrations associated with the TAWC project to illustrate potential water application and irrigation costs scenarios in sideoats grama

production (Table 1). The following analysis evaluates the potential financial incentives for using these two irrigation technologies.

**Assumptions**

Table 1 provides the basic water use and irrigation cost assumptions for side oats irrigation. For the purpose of illustrating the two different technologies, two demonstration sites were used, including a 130-acre pivot site (Site 7) and 61.8-acre SDI site (Site 8). Production costs were derived from custom rates and estimates of per acre overhead charges from the two 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 two separate demonstration sites located adjacent to one another on the same farm. No difference in soil types, rainfall and management practices were associated within these

| Table 1: Side Oats Grama Irrigation Application and Cost Information Per Acre in 2007. |                   |        |                     |                           |                                |                        |                              |
|--|-------------------|--------|---------------------|---------------------------|--------------------------------|------------------------|------------------------------|
| 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. ) |
| 7  | Pivot             | 130.00 | 13.39               | \$140.59                  | \$10.50                        | 197                    | 14.71                        |
| 8  | SDI               | 61.80  | 15.67               | \$202.20                  | \$12.90                        | 206                    | 13.15                        |

**Table 2: 10-Year Average Financial Indicators Per Acre for Side Oats Grama.**

| Demo Site | Irrigation Method | Total Cash Receipts | Total Cash Costs | Net Cash Farm Income | Prob Net Cash Income <0 (%) | Average Annual Operating Expenses/Receipts |
|-----------|-------------------|---------------------|------------------|----------------------|-----------------------------|--|
| 7         | Pivot             | \$1,656.00          | \$1,308.00       | \$348.00             | 15.40                       | 0.81                                       |
| 8         | SDI               | \$1,598.00          | \$1,358.00       | \$240.00             | 24.90                       | 0.87                                       |

two sites. As a result, the two sites are a relatively controlled experiment for comparison purposes. This comparison is a case study example illustrating results of these sites. The first site (7), assumes a center pivot overhead cost of \$33.60/acre/year and the SDI site (8) cost is \$75.00/acre/year based on typical costs and useful life of the systems. 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.

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 \$1,656/acre for the pivot (Site 7) and \$1,598/acre for the SDI (Site 8) over the 10-year period. Average cash costs range from \$1,308/acre for the pivot (Site 7) to \$1,358/acre for SDI (Site 8).

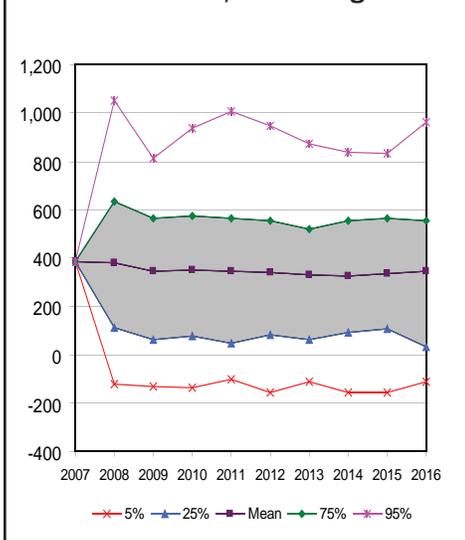
Average Net Cash Farm Income (NCFI) is the highest for the pivot (Site 7) at \$348/acre while the SDI (Site 8) is \$240/acre (Table 2; Figures 1-2). NCFI decreases slightly for both sites

### Results

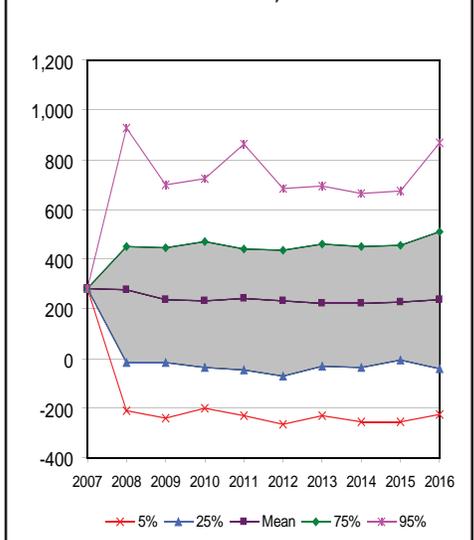
Irrigation costs and yields per acre inch for 2007 are compared in Table 1. These results show that the costs for the pivot (Site 7) were \$10.50 per acre inch, including the system cost, as compared to \$12.90 per acre inch for the SDI (Site 8). Yields were 14.71 pounds per acre inch for the pivot (Site7) and 13.15 pounds per acre inch for the SDI (Site 8).

Comprehensive projections, including price and yield risk for each irrigation method, are illustrated in Table 2 and Figures 1-2.

**Figure 1. Projected Variability in Net Cash Farm Income per Acre for Side Oats Grama, Pivot Irrigation**



**Figure 2. Projected Variability in Net Cash Farm Income per Acre for Side Oats Grama, SDI**



from 2007 to 2008 due to increases in fuel and fertilizer costs, then flattening in the later years. Both scenarios reflect significant levels of risk (Figures 1-2). Risk projections also indicate a 15.4% or less chance of a negative NCFI for Site 7, compared to 24.9% for Site 8 (Table 2).

## Summary

The case study results of comparing irrigation methods for side oats grama illustrate a variation of possible water application rates and irrigation costs. Demonstration results vary little due to similarities in yields and management practices. Site 7 demonstrates a profitable use of center pivot sprinkler technology in grass seed and hay production. However, site 8 demonstrates, that even with the use of SDI technology, production is not increased enough to offset the higher cost of the SDI system in this case study. These two demonstrations provide a unique and site specific comparison of center pivot vs. SDI irrigation systems for the 2007 crop season. It is important to note that the advantages and disadvantages of various irrigation systems will vary by crops, soil types, and seasons.

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