Using forages to conserve water in semi-arid irrigated cropping systems

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Introduction

The Texas High Plains are part of the largest, continuously irrigated cropland in the USA, and draws water from the Ogallala aquifer. High crop prices, increased demand for maize for ethanol production, and severe drought have increased water depletion rates. Research has shown that integrating forages and grazing cattle into the cotton-dominant cropping system can reduce overall water use (Allen et al. 2012) while still offering farmers positive net returns (Johnson et al. 2013). Integrating forages with row crops also reduces needs for nitrogen (N) fertilizer, rebuilds soil organic matter (Acosta-Martinez et al. 2010), and reduces fossil energy use and associated carbon emissions (Zilverberg et al. 2012). Advances in irrigation delivery that minimize evaporation losses and the use of irrigation scheduling tools that factor in soil water availability and crop needs for evapotranspiration (ET) are keys to improving whole-system water use efficiency.

The Texas Alliance for Water Conservation (TAWC) is an on-farm demonstration project consisting of a multidisciplinary team of agricultural scientists, resource managers, and producers formed in 2004 at Texas Tech University, Lubbock, TX and overseen by a local producer board and a professional management team.

Objectives

- Demonstrate how to reduce total water use
- Demonstrate how to enhance profitability
- Identify effective crop and irrigation systems
- Impact producer decision-making

References


Methods

Monitoring sites were established on 29-33 commercial farms (varied across years) in Hale and Floyd Counties, 50-80 km north of Lubbock, Texas, USA. Each farm-year combination was considered a representative of an agricultural production system.

Systems included:

- Crop monocultures
- Multi-crop
- Integrated crop/livestock
- Beef cow/calf
- Seed/hay production

Data collection included:

- Water pumped
- Measurements of ET
- Crop/livestock yields

All production and marketing decisions were made by the cooperating producers.

Conclusions

Compared with traditional row-crop systems, forages for cattle grazing, hay, and seed production:

- Reduced water use
- Yielded the greatest net returns per unit of irrigation water used.
- Are viable alternatives in semi-arid environments where irrigation is in decline.
- Contribute environmental benefits that promote long-term agricultural and soil sustainability.

The TAWC project provides a model for other water-limited environments to promote farmer adoption of water-conserving technologies.

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