

Thoughts and Challenges

COVER CROPS



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PERCEPTIONS ABOUT COVER CROPS

✘ Positive

- + Protect the soil surface
- + Increase soil organic matter
- + Reduce soil erosion
- + Extract nitrogen and sequester carbon

✘ Negative

- + Cost of cover crops
- + Management of the crop residue for establishment of the economic crop
- + Removal of soil water from the soil profile to reduce availability of soil water for the economic crop



EXPERIENCES WITH COVER CROPS

- ✘ Nitrate concentration changes in the Raccoon River watershed are related to the removal of small grains and hay from the cropping system (Hatfield et al. 2009, JSWC, 64:190-199)
- ✘ On a large scale, the principles of effective cover crops affect water quality and strategically placed within a watershed would have positive results on water quality



COVER CROPS AND WATER BALANCE

- ✘ One of the major questions about cover crops is their effect on soil water balance
- ✘ Two studies in different climates
 - + West Texas in cotton production systems
 - + Central Iowa on corn-soybean production systems



WEST TEXAS COTTON PRODUCTION

- ✘ Wheat as a cover crop planted after cotton or sorghum and then killed at the boot stage and left standing to plant cotton into the stubble
- ✘ Concern that in this area with 16 inches of annual rainfall the wheat would use soil water and cause water stress in the cotton
- ✘ Concern the wheat stubble would be a refuge for thrips to cause damage in the cotton



RESULTS

- ✘ Soil water use rates were lower with the cover crop than bare soil because tillage operations for the bare soil increased evaporation by nearly 30%.
- ✘ Standing wheat residue created a microclimate that sheltered the cotton from the high winds, blowing sand, and high surface temperatures creating higher water use efficiency and better growth.



CENTRAL IOWA CORN-SOYBEAN SYSTEMS

- ✘ Rye and oat cover crops are used after soybean to protect the soil surface.
- ✘ Little is understood about the water use rates from these crops over the winter and early spring.
- ✘ Measured the water use rates from rye, oats, and bare soil environments.



RESULTS

- ✘ Daily soil water evaporation rates were considerable for all surfaces from Oct 16 through April 5
- ✘ In 1994-1995, there was no differences in the in the seasonal water use among the three ground covers
- ✘ In 1996-1997, the bare soil had the highest cumulative water use over the rye by 3.5 inches and oats by 1.6 inches



THE ROLE OF COVER CROPS

- ✘ Cover crops reduce water evaporation from the surface because of their cover over the surface compared to a bare soil.
- ✘ The reduction in tillage operations further reduces the soil water evaporation rates.
- ✘ In water limited environments, increasing soil water availability is a positive for subsequent plant growth
- ✘ Protection of the soil surface also increases soil water infiltration



COVER CROPS

- ✘ Management of the soil water balance should be considered as a positive for cover crops and improvement of soil water infiltration, reduction in soil water evaporation, and decreasing water extraction from the soil would impact subsequent plant growth.
- ✘ Linking water and nitrogen management through mechanistic models would help define the advantages of cover crops for producers.

