



HOME  
RESEARCH  
PROGRAMS  
CURRENT  
RESEARCH  
PUBLICATIONS  
SOFTWARE  
PERSONNEL  
WEATHER  
NSTL INFO  
LINKS  
CONTACT US  
TILLAGE  
DEMO

## WATER USE IN DIFFERENT TILLAGE SYSTEMS

USDA-ARS, National Soil Tilth Laboratory  
J.L. Hatfield and J.H. Prueger

### Problem

Crop establishment is dependent upon the availability of adequate soil water in the upper soil profile after planting. We have observed that crop residue decreases the soil water evaporation rate; however, it is unclear how this extra water might affect crop water use later in the season. Different tillage systems have been reported to exhibit different water use rates. There have been few comparisons among tillage systems across a number of years to provide potential guidance for producers on how to cope with the erratic rainfall patterns that are becoming more prevalent across the Midwest. The concern about the effect of different tillage practices on water storage and the linkage to pesticide and nutrient movement is an area of concern in terms of potential management implications.

### Approach

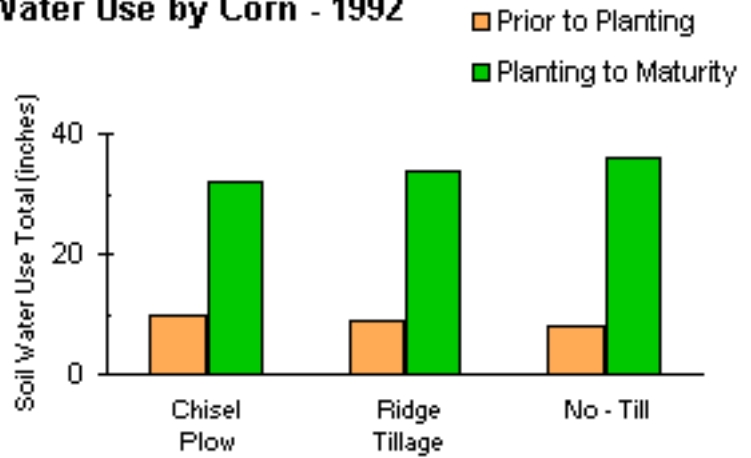
Production scale fields in Walnut Creek watershed have been monitored with Bowen ratio equipment since 1990. These fields have a range of tillage practices, chisel-plow, no-till, and ridge tillage, and are planted to corn and soybeans. These instruments have been installed and measure the energy balance, latent heat, and sensible heat fluxes throughout the year at a data collection interval of 30 minutes. Verification of the performance of the Bowen ratio system has been done by a rigorous quality assurance/quality control program and comparison with eddy correlation methods.

### Findings and Application of Results

Crop residue cover before planting reduced the soil water evaporation rate, and both the ridge tillage and no-till fields showed a reduction in water use as shown in the figure at the right. The

reduction in the no-till field was due to the presence of residue across the surface while the reduction in the ridge tillage field was attributed to the disturbance of the field only at planting. The increase in stored soil water in the residue management systems increased the water use throughout the period after planting. This increase in soil water use was through transpiration rather than soil water evaporation. Residue management systems can increase soil water availability and would reduce variation in crop yield in years with erratic rainfall. Producers can utilize the stored soil water to help alleviate stress in the early stages of crop growth.

**Water Use by Corn - 1992**



[webmaster@www.nstl.gov](mailto:webmaster@www.nstl.gov)

Monday June 25 2001

[www.nstl.gov/research/onepage/tillage.html](http://www.nstl.gov/research/onepage/tillage.html)