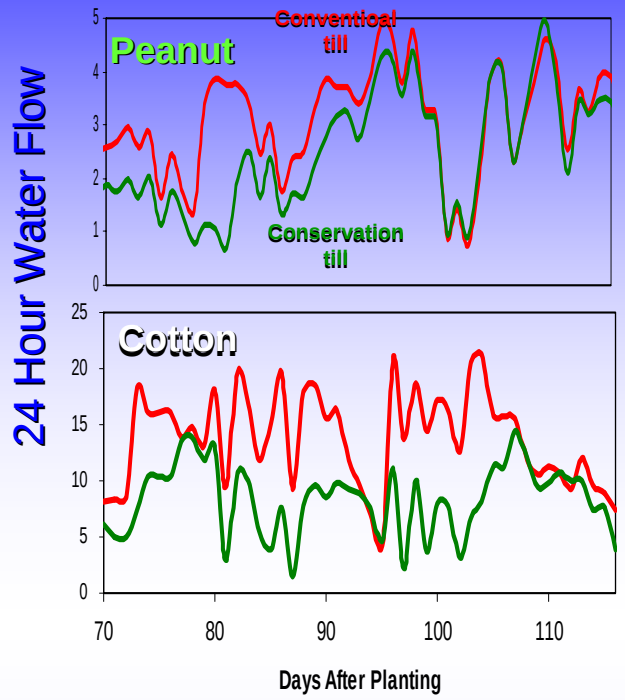
Tillage Effects on water use

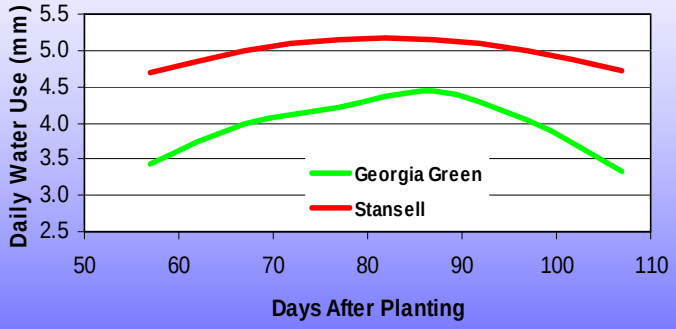


Using a direct measurement of plant water use (sap flow) results consistently show lower crop water use in conservation tillage peanut, cotton, and corn – especially under dry conditions

Crop water use curves

Water use curves are needed to accurately pinpoint irrigation scheduling through the season. Rainfall control plots at NPRL allow us to completely control water application and measure water use at each stage of growth.

Currently available curves were created in the 1970's. NPRL's updated curves show lowered water use and can improve irrigation efficiency.



For more information, contact Diane Rowland or Wilson Faircloth, USDA-ARS, National Peanut Research Laboratory, Dawson, GA

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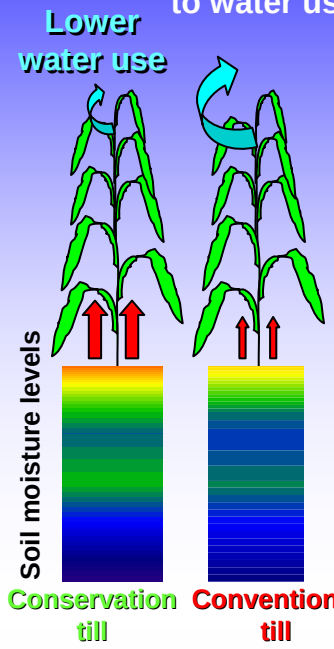
Crop Water Use Research

On-going research at the National Peanut Research Laboratory, Dawson, GA

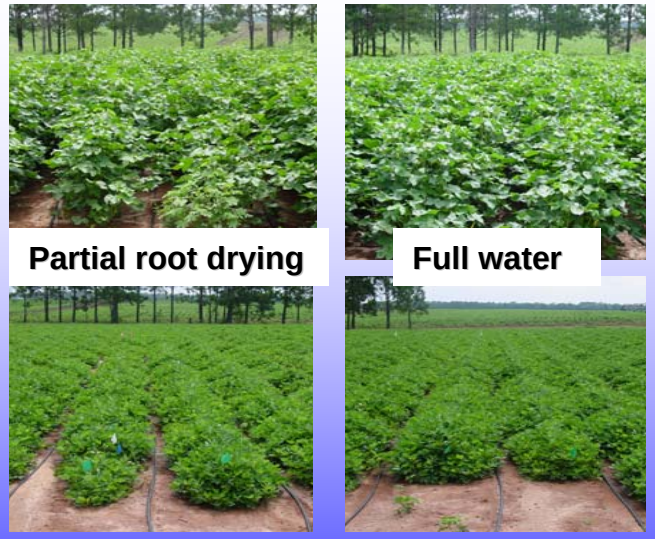
USDA ARS

Crop signaling

Plants have a variety of methods to "sense" water stress and signal changes to water use in the leaf.



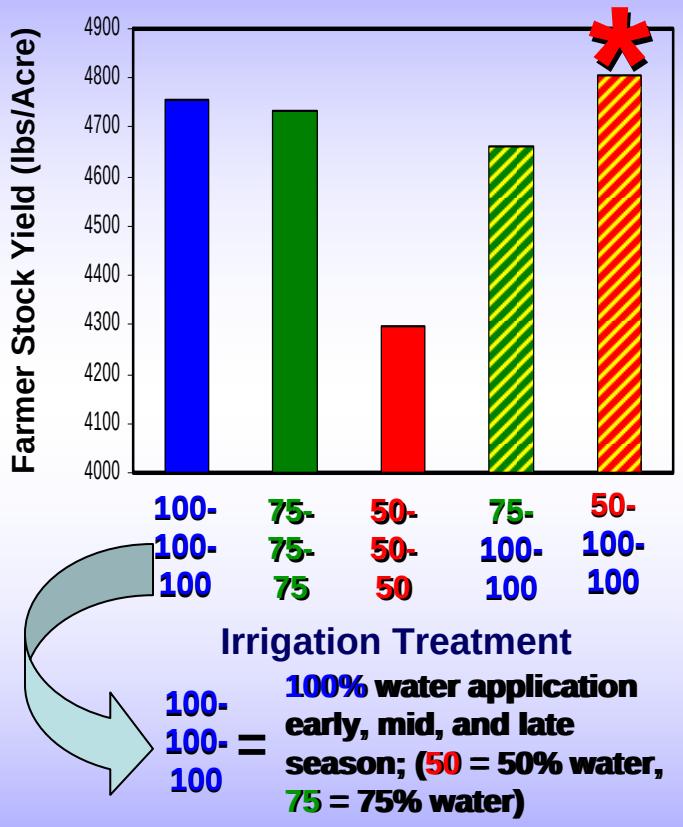
In conservation tillage, soil moisture can be more variable from surface to deep layers and this can often cause plant roots to "signal" to the leaf to decrease water use. This may be one reason why we see lower levels of water use in conservation tillage.



Applying water to only one half of the crop's root system often causes increased root signals and decreased water use. We applied water to one half of the root system of peanuts and cotton for a two week period and then switched sides and continued this pattern all season. We were able to maintain yield, decrease canopy size, and save water at the same time.

Acclimation to Drought

It turns out a little bit of drought stress can be good for peanuts in some situations. Early season drought stress can make a peanut plant "more fit" and better able to withstand water stress later in the season.



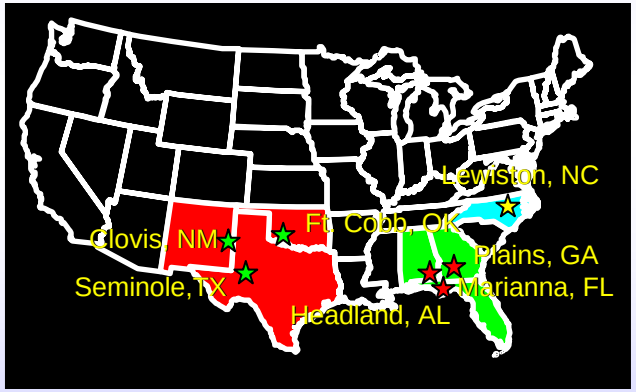
Exposure to early season water deficit can:

- Increase root growth
- Increase physiology
- Increase flower and peg production
- Maintain yield with less water used

Water-use efficiency

Season-long water-use efficiency (WUE) can be evaluated by looking at carbon isotopes (non-radioactive) in peanut leaf tissue. This "isotopic signature" tells us the amount of carbon the crop is fixing for the amount of water it uses = water-use efficiency.

Are some varieties of peanut better at using water more efficiently than others?



By conducting a regional survey of carbon isotope levels in many different varieties and in many different regions, it turns out that there is a good deal of genetic variability in WUE which means that breeding for higher WUE is possible!