

2008 Results Summary for the Peanut and Corn commission grants – Dana Sullivan et al.
Title: A Systems-Based Approach to Evaluating the Benefits of Conservation Tillage in the Southeastern Coastal Plain

Background (2007 planted to Corn, 2008 planted to Peanut)

Due to escalating concerns for water resources and the current drought, alternative management practices that reduce irrigation without incurring a yield loss are a necessity. The current study is designed to evaluate the impact of winter cover crop management and reduced tillage on crop response and yield. Treatments were all managed using minimum irrigation in a two-year corn/peanut rotation. Five tillage/winter cover treatments were evaluated: fallow (conventional tillage), long-term rye (established 2000), new rye (established 2006), clover, and a rye/clover mixture. During the fall of 2007 a secondary treatment factor (cover crop planting date) was added to the study and two additional cover crops were added (rye-winter pea mix and faba bean). Detailed soil, water and plant measurements including: soil water content, soil organic carbon/nitrogen, microbial activity, bulk density, plant tissue, stomatal conductance, yield and remotely sensed data were collected to evaluate each tillage/winter cover crop treatment. A summary of the results for the 2008 growing season are presented below.

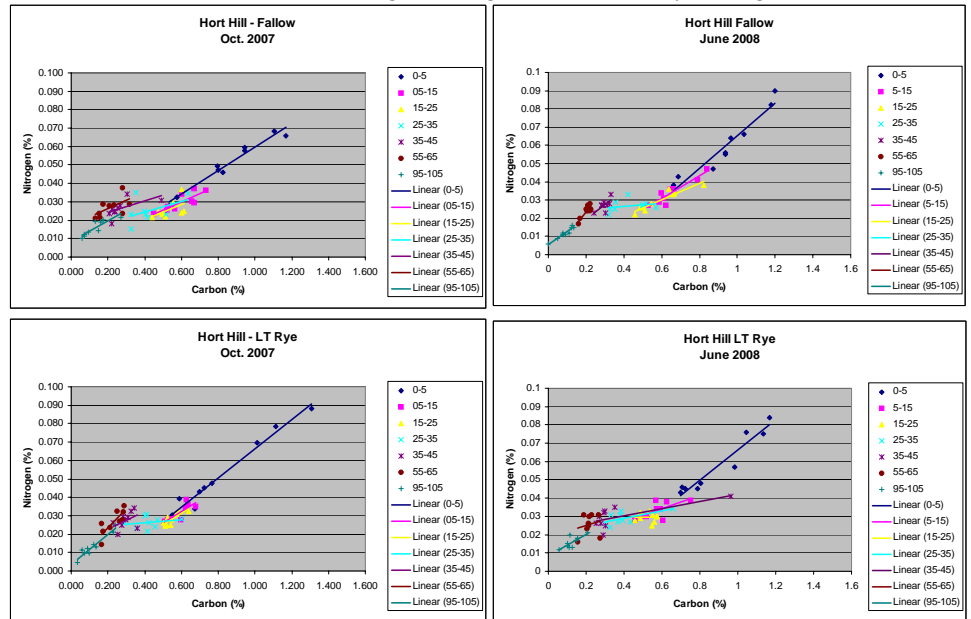
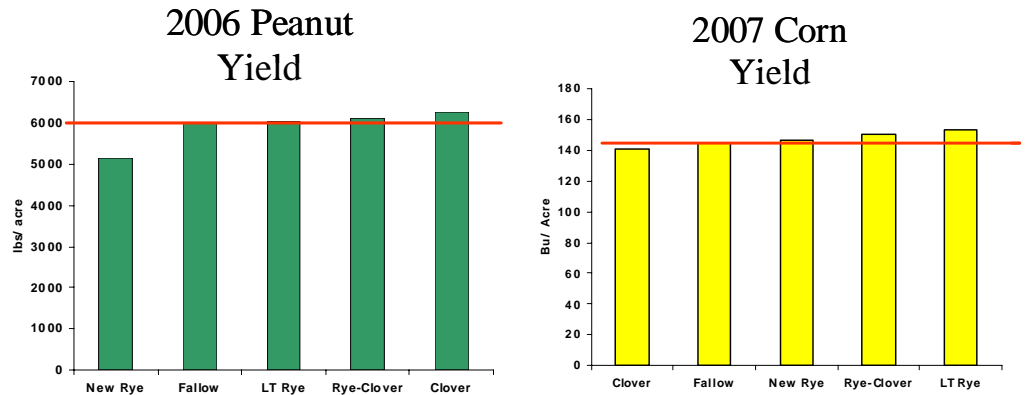
Results and Discussion

The first two years have shown slight-to-no yield advantages (< 200 lbs/acre for peanuts and < 10 bu/acre for corn) to conservation tillage and long-term (6 years)

management of a winter (rye or clover) cover crops. The trend in yield data also suggests that the newly established rye (2 years) plots are comparable in yield to conventional tillage and fallow winter cover as well. These data indicate that yield benefits to conservation tillage management are likely a long term goal, requiring a minimum maintenance period of 2-3 years.

Based on a preliminary analysis of the rooting and soil water data, the following projections were made:

1. Conservation tillage plots with winter covers of long-term rye show enhanced rooting at depths of 5-65 cm as compared to conventional tillage plots left fallow in winter (roots at 25-35 cm; June 2008 figure),
2. The 2007 corn crop



appeared to follow similar differences in rooting patterns with rooting from 25-45 cm in the conservation till LT-rye and from 5-45 cm in the conventional till fallow plots (Oct 2007 figure),

3. At depth (20-60 cm), conservation tillage treatments had significantly lower soil water contents throughout the growing season (2007 Corn - CT > RN = RC > R3 = C; 2008 Peanut - CT > RC > R3 > RN = C),
4. No differences in soil water content were observed at 60 and 100 cm, therefore it appears that the root systems are primarily utilizing water from the upper 40 cm. This fits with our observations that the Bt horizon in these plots varies from depths of 41-69 cm. The Bt likely serves as a layer impeding water percolation and roots may be concentrating at this level in the conservation system.

Impact:

Direct measurements of the plant canopies for two years of peanut and one of corn indicate that during dry-down following irrigation events, long-term conservation tillage treatments continue to maintain cooler canopies via transpiration of water even though there is less soil water than in the conventional till fallow plots. This results in 4-6 additional days between required irrigation events.

