

2007 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)

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. 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 2007 growing season are presented below.

Results and Discussion

During the 2007 growing season there was a slight yield advantage (10 bu/acre) to conservation tillage and long-term (6 years) management of a winter rye cover crop. The trend in yield data also suggests that the newly established rye (2 years) plots are also beginning to show a yield advantage as well. These data indicate that benefits to conservation tillage management are likely a long term goal, requiring a minimum maintenance period of two years.

Based on a preliminary analyses of the 2006 and 2007 soil water data, the following projections were made:

1. conservation tillage plots had significantly higher soil water at the 10 cm prior to canopy closure,
2. higher surface soil water content at planting through canopy closure could have contributed to a healthier and more robust root system, which utilizes more water and has a greater ability to exploit water resources deeper in the soil profile,
3. at depth (20-40 cm), conservation tillage treatments had significantly lower soil water contents throughout the growing season, we believe this is related to root exploration of the old root channels (established by the winter cover crop),
4. no differences in soil water content were observed at 60 and 100 cm, therefore it appears that the root system is primarily utilizing water from the upper 40 cm.

The above findings are supported by direct measurements of the plant canopy during an induced drought that began on June 18th, and was maintained through June 28th as follows:

1. Under induced drought conditions, long-term conservation tillage treatments continue to maintain cooler canopies via transpiration of water,
2. A greenness index (remotely sensed data) shows that signs of drought stress were delayed as much as four days in the long term rye, new rye and rye-clover cover treatments.

Potential Impact

1. Conservation tillage reduces fuels costs with an average savings of \$13/ac.
2. Using similar amounts of water, conservation tillage plots were more tolerant of drought, delaying symptoms of stress by four days.
3. Taking into account the cost to plant the winter cover crop, fuel savings and increased yields associated with the long-term rye cover crop these results suggest an overall savings of \$41/acre.

Figure 1. Corn yields represented in grams/plot for the 2007 growing season.

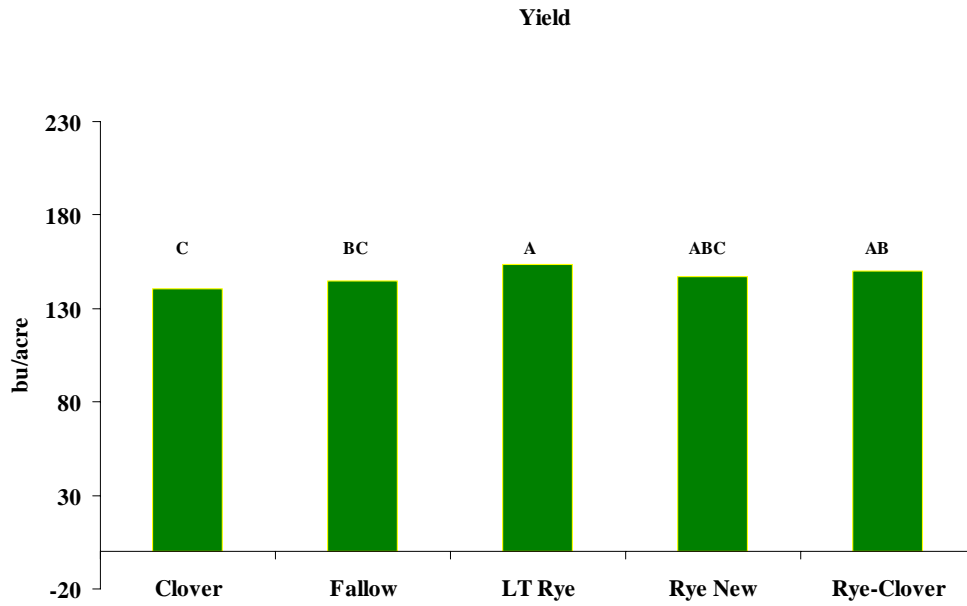


Figure 2. Reflectance data were used to calculate a vegetation index that indicates vigor/health. Higher values suggest the canopy is maintaining itself despite the lack of water during an imposed drought.

