

MEASURING SOIL QUALITY ON THE "OLD ROTATION"

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Abstract

Recent interest in soil quality has been stimulated by increasing awareness that soil is not only important for food and fiber production but also in maintaining environmental quality. Long term rotations at the Old Rotation located at Auburn University, consist of 13 plots with 6 treatments.

- ◆ **Treatment 1:** 3 year rotation (plots #10, #11 and #12) of cotton (*Gossypium hirsutum* L.) >crimson clover cover crop (*Trifolium incarnatum* L.) >corn (*Zea Mays* L.) >wheat (*Triticum aestivum* L.) for grain (60 lbs. of N per acre) >soybean [*Glycine max* (L.) Merr.]
- ◆ **Treatment 2:** continuous cotton without a crimson clover cover crop (plot #1 and #6)
- ◆ **Treatment 3:** continuous cotton with 120 pounds of N (plot #13)
- ◆ **Treatment 4:** continuous cotton with a crimson clover cover crop (plots #2, #3 and #8)
- ◆ **Treatment 5:** 2 year rotation (plots #4 and #7) of cotton >corn > a crimson clover cover crop
- ◆ **Treatment 6:** 2 year rotation (plots #5 and #9) of cotton-corn a crimson clover cover crop plus 120 pounds of N

A study was done using 9 standard tests to measure soil quality on the Old Rotation. A Soil Quality Kit (Kit) was originally developed by the Agricultural Research Service (ARS). The Kit is for semi-quantitative assessments and for education on soil quality.

Treatments with 3 year rotations and legume cover crops had higher carbon, higher CEC, higher percent of water stable aggregates, and higher soil water content (standard test). Continuous cotton treatments (plots # 1, # 6, and # 13) were higher in soil strength at the surface down to 3 inches. The standard test for soil water content showed differences

between treatments. The soil water content test from the Kit did not show differences between treatments. The soil was wetter when the Kit test was done, which may explain the variability of the data. The standard tests and the Kit tests for hydraulic conductivity, infiltration, and pH showed similar results. The Kit's respiration test was not very useful unless carbon content from the standard test was compared. By comparing carbon to respiration, the data is more useful in measuring soil quality.

After 100 years of comparing legume cover crops and crop rotations, soil quality is better for the 3 year rotation and legumes (treatment 1) based on higher soil carbon, higher water stable aggregates, higher nutrient holding capacity, and higher water content. The Soil Quality Kit had a higher variability in all of comparisons with standard tests. The Kit is for semi-quantitative assessments and for education on soil quality. It is useful for a conservationist or farmer to compare management practices to assess a trend of soil quality and not to be used for research. If the Kit is to be truly compared to standard tests, then similar tests from the Kit should be performed the same time as standard tests. This one year study will set a baseline for soil quality for the Old Rotation. Future studies can measure the differences in soil quality utilizing this base line data.