SOIL HEALTH CONDITIONS UNDER COTTON PRODUCTION IN NORTH CAROLINA

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Abstract

Soil organic C (SOC) and N fractions are considered important indicators of soil health due to their multifunctional roles in storing and supplying nutrients, enhancing soil physical properties, and feeding soil biological activity and the important roles it has on plant nutrition. The impact of widespread crop cultivation within a region has rarely been surveyed but could provide a snapshot of soil health condition when associated with a survey of historical management. Such a survey was conducted in North Carolina under cotton cultivation. Surface residue was collected, and soil was sampled at 0-10, 10-30, and 30-60 cm depths from 120 randomly selected fields. Soil properties varied by physiographic region of Piedmont, Coastal Plain, and Flatwoods. Conservation tillage was the dominant form of cotton cultivation, but its use throughout the rotation sequence, was an even greater determinant of its positive impact on soil organic C and N fractions. Soil-test biological activity averaged 138 and 92 mg/kg/3 d under continuous conservation tillage and frequent tillage, respectively, in the surface 10-cm depth, and the effect persisted into the 10-30-cm depth (19% greater) but with lower absolute values. Cover cropping and animal manure had smaller effects on soil organic fractions and routine soil chemical properties. Intermittent tillage in the rotation sequence was the largest impediment to sustained SOC and total soil N accumulation and soil microbial properties. This assessment illustrated positive soil health condition from farmer adoption of conservation tillage, but improvements are possible with more continuous practice of conservation approaches.