Tillage Effects on Carbon and Nitrogen in a Coastal Plain Soil

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A sandy Coastal Plain area at the DOE Savannah River Site near Aiken, SC was sampled in layers to 105 or 60 cm depth prior to (March 1999) and after (June 1999) harvest of a mature loblolly pine stand. The dominant soil type across the 24 ha site is Blanton sand. A third sampling (March 2000) was made to 105 cm depth after tillage (October 1999) undertaken as site preparation for a plantation experiment. The tillage operation caused soil disturbance to approximately 30 cm depth. Several locations that were harvested but did not receive tillage were also sampled on the third occasion. The soil samples from these three samplings were sieved with a 2 mm sieve to remove coarse organic matter and small stones. Carbon and nitrogen concentrations in the bulk soil and in the particulate organic matter (POM) and mineral-associated organic matter (MOM) were determined. Separation of POM and MOM components of soil organic matter involved shaking sub samples with sodium hexametaphosphate solution to displace adsorbed MOM into solution. The solid phase POM was separated from the dissolved MOM fraction by filtration. Chemical analyses were performed with a Perkin Elmer 2400 analyzer. Soil bulk density was determined from soil cores taken before and after the tillage operation. Cultivation caused an increase in soil carbon and nitrogen concentrations in the 20 - 40 cm depth. Data from the POM and MOM analyses will test the hypothesis that tillage increased the amount of organic matter associated with soil minerals. An increase in MOM may increase the storage duration of soil carbon and nitrogen by enhancing protection of organic matter from microbial decomposition.

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