Abstract

Quantifying the role of Native Warm Season Grasses in Sequestering Soil Organic Carbon

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A study was initiated at the USDA-NRCS Cape May Plant Materials Center in 1999 to quantify soil carbon sequestration changes with the conversion from a cool season grass to native warm season grasses in a sandy, coastal plain soil (Downer sandy loam). Five native warm season grasses ('Shelter' switchgrass (*Panicum virgatum*), 'Atlantic' coastal panicgrass (*Panicum amarum var. amarulum*), 'Niagara' big bluestem (*Andropogon gerardii*), 'Rumsey' indiangrass (*Sorghastrum nutans*) and 'Pete' eastern gamagrass (*Tripsacum dactyloides*)) were no-till drilled into a spray-killed tall fescue/red fescue sod. The plots are 16' x 20' and replicated 4 times. Soil cores were obtained to 36 inches prior to establishment in 1999 and again in 2003 and 2010. Initial soil organic C (OC) concentrations averaged 1.7, 0.9, 0.4, 0.3, and 0.3% in the 0-2, 2-6, 6-12, 12-24, and 24-36 inch depths. The only significant increases in soil C measured between 1999 and 2003 were in the 24-36 in depths under switchgrass and eastern gamagrass and those increases were small (>0.2%). The 2003 data suggests that initial soil C concentrations in the upper 24 in of the soil profile may have already been near the saturation point for our sandy coastal soil with the previous cool season grass. However, the deeper rooting of the warm season grasses creates the potential to increase sequestration at deeper depths where initial C concentration is very low.

Summary

The results show after 10 years of established native warm season grasses none of the grass species led to a significant change in soil OC by depth. Some means go up a little since 1999 and some come down a little, but there were no consistent trends and the differences are not statistically significantly different. The authors hypothesize that this sandy coastal plain soil was already soil OC saturated under the previous C3 turf grasses that were growing prior to conversion to the warm season grasses. Even though the warm season grasses have greater potential for increasing soil OC and biomass production, this coarse textured soil probably didn't have the capacity hold more OC. The positive conclusion is that methods used to establish the new grass species didn't lead a loss of soil OC. That could be valuable supporting information if converting to a C4 warm season grass has benefits beyond soil OC sequestration. The results might have looked much different if the grasses had been established on a site that have been previously tilled and used for row crops.