

TOPSOIL THICKNESS IMPACT ON CORN, SOYBEAN, AND SWITCHGRASS PRODUCTIVITY AND SOIL NUTRIENT MANAGEMENT

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ABSTRACT

Topsoil thickness, or depth to claypan (DTC), is a major contributing factor to variability in corn (*Zea mays* L.) and soybean (*Glycine max* [L.]) productivity and nutrient dynamics on claypan soils. Site-specific placement of perennial crops, such as switchgrass (*Panicum virgatum* L.), and accounting for local variation in nutrient requirements could improve overall productivity in the region. Therefore, studies were conducted to: i) compare the productivity of switchgrass grown for bioenergy with corn and soybean grown over varying DTC and to ii) determine if phosphorus (P) and potassium (K) fertility management could be improved by accounting for DTC. Research was conducted in Columbia, MO from 2009 to 2016 on plots constructed with DTC representative of those typically found on Midwest claypan landscapes. Across all years, relative yield increased with DTC for corn and soybean, respectively, while switchgrass was unaffected by DTC. The greatest net return was experienced by corn and soybean at deeper DTC. Switchgrass was able to compete only with the net return of corn on very shallow DTC (<5 cm). Soil test P increased and STK decreased with DTC. The P buffering index decreased with DTC, and the amount of fertilizer K required to raise STK 1 unit was four times greater for areas of deeper DTC than shallow DTC. These relationships show that switchgrass has the capacity to reduce yield variability caused by DTC but was unable to compete with corn and soybean at current market values. Furthermore, accounting for DTC could help guide variable-rate P and K applications to raise and maintain STP and STK.