Corn stover is a feedstock for cellulosic ethanol production. However, removal of corn stover from fields could result in deterioration of soil quality and productivity. No-till (NT) production may have slightly lower corn yields compared with a traditional plow tillage system but equal or better economic returns and reduced soil erosion. Decreased corn yields under NT are in part due to lower surface soil temperature resulting in slower emergence and early-season plant development. Removal of stover residue has been shown to increase spring soil temperatures and increase yields under NT in climates where cold spring soil temperatures delay emergence and plant growth. In a recent study, we examined the balance between yield and soil properties after seven years of residue removal and showed that yield gains from partial residue removal come at a cost of reducing soil organic carbon (SOC) and minimizing the accumulation of soil N.

Understanding how NT stover management practices and N fertilizer rate interact to affect irrigated corn yields and SOC sequestration is important for developing management practices to optimize economic returns while protecting soil quality/productivity. In this study, the effects of N fertilizer rate on NT irrigated continuous corn grain and stover yields under partial stover residue removal (PR) and full stover residue retained (FR) treatments were evaluated for seven years as well as changes in SOC and total soil nitrogen (TSN), which reflect soil quality and productivity.

An average stover removal of 66% in PR treatments increased early spring soil temperatures and enhanced early plant development compared with FR (Fig. 1). The average, 1.17 tons/ac/yr, stover remaining on the soil surface in the PR treatment was only half the estimated 2.65 tons/ac/yr corn stover requirement to maintain SOC.

Nitrogen fertilization increased grain yields of both residue treatments, with PR having higher yields compared with FR at the highest N rate. There were no grain yield differences between FR and PR at the 0 and 60 lb N/ac rates, but there was a significant difference at the 180 lb N/