

Public Abstract

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ABSTRACT

As organic agriculture farmland continues to increase on a global scale with 6.5 million hectares added during 2014-2016, the increased number of organic producers will be expected to fulfill sustainability obligations. However, tillage is the dominant practice for weed control in organic agriculture, but because tillage reduces soil organic carbon (SOC) and can alter soil properties this leads to soil degradation and erosion. This study utilized propane flaming, hot water spraying, cultivation, and between-row mowing for suppression of weeds. Furthermore, the use of summer cover crops (SCC), representing an opportunity to benefit annual cropping systems by improving soil quality without drastically altering management practices, was also studied. Alternative weed treatments were integrated into an organic system that included grain crops and winter cover crops in a two year rotation, consisting of corn, soybean, and winter wheat. Post-wheat harvest practices consisted of SCC and double crop soybean (DCS). Other organic practices included compost application, crimped cover crops, and tillage after harvest. Multiple soil quality indicators were analyzed for the three properties of soil, physical, biological, and chemical. Crimped cover crop plots with hot water spray had highest overall soil quality indicator values. Soil physical properties achieved optimal values under mowing. Flaming had decreased soil quality indicator values similar to the cultivation treatment; however this showed potential improvement in soil quality when combined with high compost rates. SCC had higher overall soil quality indicator values compared to a cultivated DCS. However, with minimal cultivation and high compost rates DCS had similar soil biological values to SCC.