Friday, September 28, 2018
10:00-10:30 a.m.

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Targeted sub-field switchgrass integration could improve the farm economy, water quality, and bioenergy feedstock production

Changing the Corn Belt agro-ecological paradigm by integrating perennials into annual crop landscapes can mitigate nitrate-nitrogen (NO-N) leaching, address bioenergy feedstock targets, and may also improve farm profitability. We analyzed public environmental, agronomic, and economic data with two integrated models: a subfield agroecosystem management model, and a process-based biogeochemical model. We constructed a factorial combination of profitability and NO-N leaching thresholds and simulated targeted switchgrass integration into corn/soybean cropland in Iowa, USA. We spatially analyzed two scenarios: converting to switchgrass corn/soybean cropland losing >US$ 100 ha^{-1} and leaching >50 kg ha^{-1} ('conservative' scenario) or losing >US$ 0 ha^{-1} and leaching >20 kg ha^{-1} ('nutrient reduction' scenario). Compared to baseline, the 'conservative' scenario resulted in 12% of cropland converted to switchgrass, which produced 11 million Mg of biomass and reduced leached NO-N 18% statewide. The 'nutrient reduction' scenario converted 37% of cropland to switchgrass, producing 34 million Mg biomass and reducing leached NO-N 38% statewide. Our approach bridges the scales at which NO-N loss and profitability are usually considered, and is informed by both mechanistic and empirical understanding. Though approximated, our analysis supports development of farm-level tools that can identify locations where both farm profitability and water quality improvement can be achieved through the strategic integration of perennial vegetation.