Data from: No-till establishment improves the climate benefit of bioenergy crops on marginal grasslands

Robertson, G, Michigan State University, https://orcid.org/0000-0001-9771-9895

Ruan, Leilei, Michigan State University, W.K. Kellogg Foundation

robert30@msu.edu

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Abstract

Expanding biofuel production is expected to accelerate the conversion of unmanaged marginal lands to meet biomass feedstock needs. Greenhouse gas production during conversion jeopardizes ensuing climate benefits, but most research to date has focused only on conversion to annual crops and only following tillage. Here we report the global warming impact of converting USDA Conservation Reserve Program (CRP) grasslands to three types of bioenergy crops using no-till (NT) versus conventional tillage (CT). In three CRP fields planted to continuous corn, switchgrass, or restored prairie we established replicated NT and CT plots. For the two years following an initial soybean year in all fields, we found that, on average, NT conversion reduced nitrous oxide (N2O) emissions by 50% and carbon dioxide (CO2) emissions by 20% compared to CT conversion. Differences were higher in year 1 than in year 2 in the continuous corn field, and in the two perennial systems the differences disappeared after year 1. In all fields net CO2 emissions (as measured by eddy covariance) were positive for the

first two years following CT establishment, but following NT establishment net CO2 emissions were close to zero or negative, indicating net C sequestration. Overall, NT improved the global warming impact of biofuel crop establishment following CRP conversion by over 20-fold compared to CT (-6.01 Mg CO2e ha-1 yr-1 for NT vs. -0.25 Mg CO2e ha-1 yr-1 for CT, on average). We also found that IPCC estimates of N2O emissions (as measured by static chambers) greatly underestimated actual emissions for converted fields regardless of tillage. Policies should encourage adoption of NT for converting
marginal grasslands to perennial bioenergy crops in order to reduce carbon debt and maximize climate benefits.

Methods

Methods of data collection and processing are given in the associated SSSAJ publication.

Usage Notes

Data set description is given in the file "readme_no-till_establishment.txt".

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References

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Files

2 files for this dataset

dataset_no-till_e...tablishment.xlsx	495.45 kB	application/vnd.openxmlformats-officedocument.spreadsheetml.sheet

readme_no-till_establishment.txt	6.23 kB	text/plain

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