123. Nitrous oxide emissions from Midwest row-crops: Comparing presence and absence of winter cover crops

Neville Millar1,2, Dean G. Baas3, and G. Philip Robertson (robert30@msu.edu)1,2*

1W.K. Kellogg Biological Station, Michigan State University, Hickory Corners, MI; 2Dept. of Plant, Soil and Microbial Sciences, Michigan State University, East Lansing, MI; 3Michigan State University Extension, Michigan State University, Centreville, MI.

https://www.glbrc.org/research/sustainability http://cris.nifa.usda.gov/cgi-bin/starfinder/28112/crisassist.txt

Project Goals: Quantify multi-year emissions of the potent greenhouse gas (GHG) nitrous oxide (N2O) from cover crop systems under varying management to 1) improve the accuracy of inventories of crop based agricultural GHG emissions, and 2) evaluate the potential of cover crops as a GHG mitigation strategy.

Nitrous oxide (N2O) is the largest contributor to the greenhouse gas burden of cropping systems in the US, with emissions primarily due to N fertilizer inputs and other soil management activities. The practice of including winter cover crops in corn-based row-crop systems is not widely adopted but is increasing. The beneficial impacts of cover crops, that include reduced soil erosion, increased SOM, and weed suppression, are well known. However, very few studies have investigated the effect of including cover crops in row-crop rotations on N2O emissions.

Here, we will present three years of N2O emissions data from a corn-soybean-winter wheat rotation, either with or without cover crops, situated at the Kellogg Biological Station in SW Michigan. Results will explore the effects of cover crop presence or absence, cover crop type (grass, legume, Brassica), and cover crop termination time (early vs. late) on emissions of N2O.

Over the three years, results show that: 1) including cover crops did not have much affect on N2O emissions compared to no cover crops (Fig 1); 2) cover crop type and cover crop termination time had no overall affect on total N2O emissions (Fig 2); 3) N2O emissions were highest in corn (vs. wheat and soybean) in all years (Fig 3); and, 4) highest fluxes occurred following N fertilization, soil disturbance, and rainfall (soil wetting).

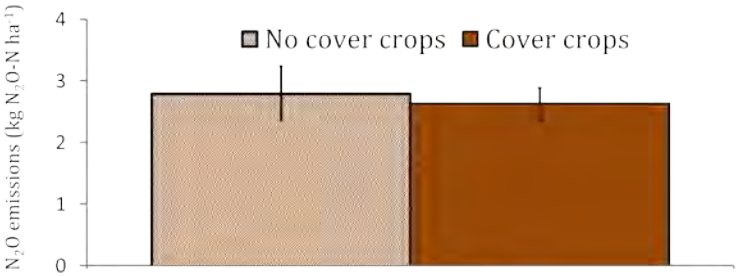

Fig 1. Average total N2O emissions from all treatments with and without cover crops (2012 – 2014).

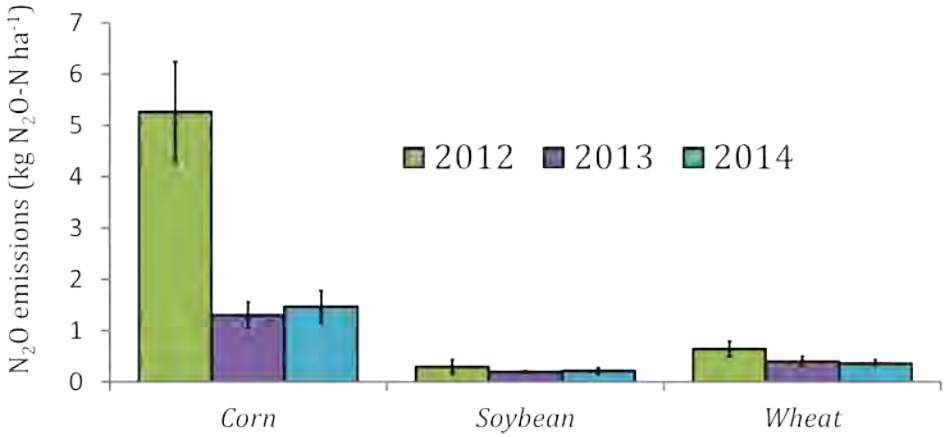

Fig 2. Average total N2O emissions from cash crops with cover crops (2012 – 2014).

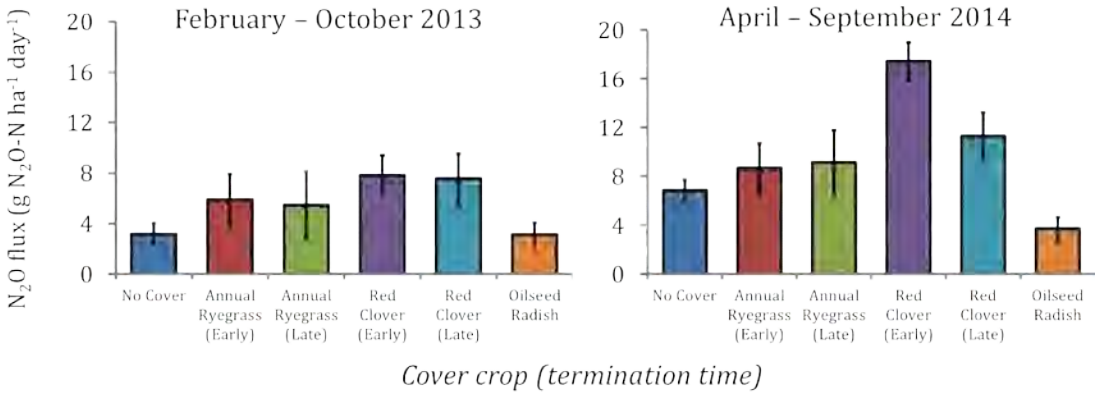

Fig 3. Average daily N2O fluxes from no cover crop and cover crop treatments during corn phase following cover crop termination (2013 and 2014).

Funding statement: This work was funded in part by the Great Lakes Bioenergy Research Center (DOE BER Office of Science DE-FC02-07ER64494), the DOE OBP Office of Energy Efficiency and Renewable Energy (DE-AC05-76RL01830), and the USDA NIFA grant ORG: 2011-51106-31046.