SOIL MANAGEMENT AND LANDSCAPE EFFECTS ON METHANE, NITROUS OXIDE AND CARBON DIOXIDE FLUXES

Catherine N. Gacengo[1*], C. Wesley Wood[1], Joey N. Shaw[1], Kipling S. Balkcom[2] and Randy L. Raper[2]

[1]Department of Agronomy and Soils, 202 Funchess Hall, Auburn University, AL 36849-5412
[2]USDA-ARS, 411 South Donahue Drive, Auburn, Al 36832
[*]Corresponding author's e-mail address: gachecn@auburn.edu

ABSTRACT

Knowledge of interactive effects of agricultural soil management and landscape variability on greenhouse gas emissions is necessary for soil organic carbon sequestration efforts. This study evaluates the effects of tillage, dairy manure and landscape position on nitrous oxide (N_2O), methane (CH_4) and carbon dioxide (CO_2) emissions from a corn (*Zea may* L.)-cotton (*Gossypium hirsutum* L.) rotation. Gas samples were collected seasonally using a closed chamber method on a field-scale experiment near Shorter, AL, in spring 2004 through winter 2005. Treatments included conservation tillage (CsT) and conventional tillage (CT) with or without dairy manure (DM) application distributed over three landscape positions: drainageway, sideslope, and upland. In spring 2004, tillage, landscape variability, and DM significantly influenced total methane emission (p=0.0361), with DM increasing total methane emission on sideslopes by 20%. Mean CO_2 fluxes were significantly different among treatments (p= 0.0255). Dairy manure decreased CO_2 flux on upland CT and sideslopes CsT treatments by 10% and 20% respectively, while it increased the flux on concave CsT treatment by 20%. In winter 2005, CO_2 flux was in the order upland>sideslope>drainageway. Nitrous oxide flux was significantly different among treatments only in spring 2004 (p= 0.0001). Dairy manure increased N_2O flux on upland CT treatment by 10%. Nitrous oxide flux was in the order upland>drainageway>sideslope. Adopting CsT in spring through fall can decrease CO_2 and N_2O emissions in these agricultural systems; however, CsT may increase winter CO_2 fluxes. It is apparent that soil management and landscape position interact to control greenhouse gas emissions from agricultural fields.