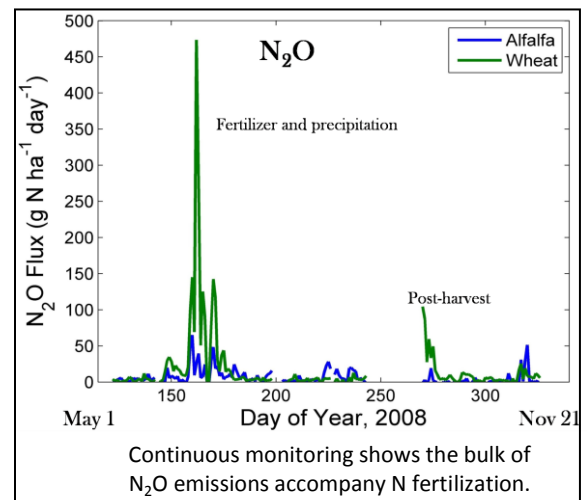


Feature Research Project

Greenhouse gas mitigation: Reducing nitrous oxide emissions from agricultural land

Spring! That refreshing time of year when the frozen landscape comes to life – literally. Warming soils boost microbial activity, transforming soil nitrogen reserves. Water from melting snow and spring rains fills soil pores, reducing oxygen availability, and stimulates the release of nitrous oxide (N_2O), a greenhouse gas 300 times more powerful than carbon dioxide. Common thinking associates the majority of N_2O loss from agricultural soils with denitrification, a process whereby N_2O is released when nitrate is converted to N_2 in saturated soils, but soil scientists on the NCLE team are finding another process to be very important.

Mario Tenuta, Canada Research Chair in Applied Soil Ecology, leads greenhouse gas (GHG) research at the NCLE Trace-Gas-Manitoba (TGAS-MAN) site and other locations around the province. “Continuous monitoring of N_2O shows that whether N comes from synthetic fertilizer or manure it can be lost as N_2O ”, says Tenuta. “Emissions are associated with the short period during spring-thaw and just after fertilization with synthetic fertilizers or liquid manures.” The research is demonstrating the reason for the emissions at these times of the year differs. While losses accompanying spring-thaw seem to be driven by denitrification, losses following fertilizer application seem to occur during nitrification, the conversion of ammonium to nitrate. The figure shows N_2O emissions at TGAS-MAN shortly following urea application to spring wheat but little emissions from alfalfa that did not receive fertilizer.



Don Flaten, soil fertility researcher and Chair of NCLE agrees, “We are seeing the same trend following synthetic N fertilizer application. If it’s applied in the ammonium form, we measure at least as much if not more loss of N_2O as when it’s applied as nitrate, so nitrification must be an important source of emissions.”

Through a number of studies, NCLE researchers are quantifying N_2O emissions and determining how losses relate to fertilizer source and application management, specifically comparisons of manure and synthetic fertilizers, land management such as tillage, and crop management such as inclusion of perennials in annual rotations, as well as factors over which we have limited control, namely soil type and climate. Researchers are also studying the biological processes controlling N_2O emissions so that reduction management strategies can take into account the mechanisms that are driving losses under Manitoba conditions.

In addition to developing a series of beneficial management strategies (BMPs) to reduce GHG emissions, NCLE researchers are establishing a locally valid baseline for N_2O emissions from Manitoba farms. By building a database of current emissions under agronomic practices and environmental conditions representative of Manitoba, we can quantify the real emissions of greenhouse gases from Manitoba farms and the effectiveness of BMPs that will truly help to reduce those emissions.

For more information on agricultural greenhouse gas emissions related to manure, soil and crop management, please contact Mario Tenuta (tenutam@cc.umanitoba.ca).

For a complete list of these and other **NCLE research projects**, visit <http://www.umanitoba.ca/afs/ncle/>

Instant Update

Traceability Workshop - Trace R & D 2009

June 2-3, 2009 at the Fairmont Hotel, Winnipeg. This event is an important step in the development of a national strategy for R&D in agriculture and food traceability. Conference participants will include industry stakeholders, funding agencies, researchers as well as policy and extension specialists from provincial and federal governments. For details, visit <http://www.umanitoba.ca/afs/trace/>



NCLE representation on Manitoba Rural Adaptation Council

NCLE graduate student Gwendolyn Donohoe was recently elected as the student director on the MRAC Board. Gwendolyn is studying greenhouse gas emissions from cattle feces and urine during spring thaw in a pasture overwintering system under the supervision of soil scientists Mario Tenuta and Don Flaten. In addition to her studies, she maintains a small herd of cattle on her parents' farm near The Pas and is chair of her local Conservation District. Gwendolyn joins Derek Brewin on the MRAC Board, an agricultural economist involved with NCLE research looking into economic sustainability of livestock systems.

Phosphorus runoff and leaching losses from manure amended soils: Comparisons of cattle, pig and synthetic P sources. For more information on this MLMMI-funded project, please come to our website to read the Final Report (<http://umanitoba.ca/afs/ncle/FlatenPrunofflossmanuresFinal.pdf>) or the Extension Report (<http://umanitoba.ca/afs/ncle/FlatenPrunofflossmanuresextension.pdf>) or contact project leader Don Flaten (Don_Flaten@umanitoba.ca).

Greenhouse gas emissions related to perennial forage-annual crop conversions. Graduate students Trevor Fraser and Siobhan Stewart recently shared information on these projects at the Manitoba Soil Science Society Meetings in Winnipeg. Siobhan's research was also featured at the Canadian Carbon Program meetings in Vancouver. To learn more, see their posters at <http://umanitoba.ca/afs/ncle/Newsletters.html> or contact Brian Amiro (brian_amiro@umanitoba.ca) or Mario Tenuta (tenutam@cc.umanitoba.ca).



Siobhan works with the GHG monitoring equipment at TGAS-MAN

Rumen microbial community and pathogen shedding from cattle during overwintering. The intensive monitoring component of this study, where Denis Krause and graduate student Gary Rent are evaluating how use of dried distillers grains in low quality forage diets and cold stress impact rumen microbial populations using global gene expression technologies, wrapped up in February. Beginning later this year Denis will look at pathogen shedding. For more information, contact Denis Krause (denis_krause@umanitoba.ca).

New Publication on Pathogens and Human and Animal Health. Examination of Salmonella and Escherichia coli translocation from hog manure to forage, soil and cattle grazed on the hog manure-treated pasture. Holley, R., Walkty, J., Blank, B., Tenuta, M., Ominski, K., Krause, K., and Ng, L.K. Journal of Environmental Quality 37:2083-2092.

We want to hear from you! ... whether your interest lies in NCLE research, teaching or our extension activities, please direct your inquiries to Christine Rawluk, the NCLE Research Development Coordinator (Christine_Rawluk@umanitoba.ca) or (204) 474-8127.

Help spread the news! Please share this newsletter with others who may be interested. Send an email to Christine_Rawluk@umanitoba.ca to sign up for our bi-monthly newsletter.