GLOBAL NITROGEN INNOVATION CENTER FOR CLEAN ENERGY AND THE ENVIRONMENT (NICCEE)

2026 NITROGEN SUMMER INSTITUTE

June 16 - 17, 2026

Delta Hotels Guelph Conference Centre
50 Stone Rd W
Guelph, ON N1G 0A9, Canada

NSERC CRSNG

UKRI Engineering and Physical Sciences Research Council

NSF

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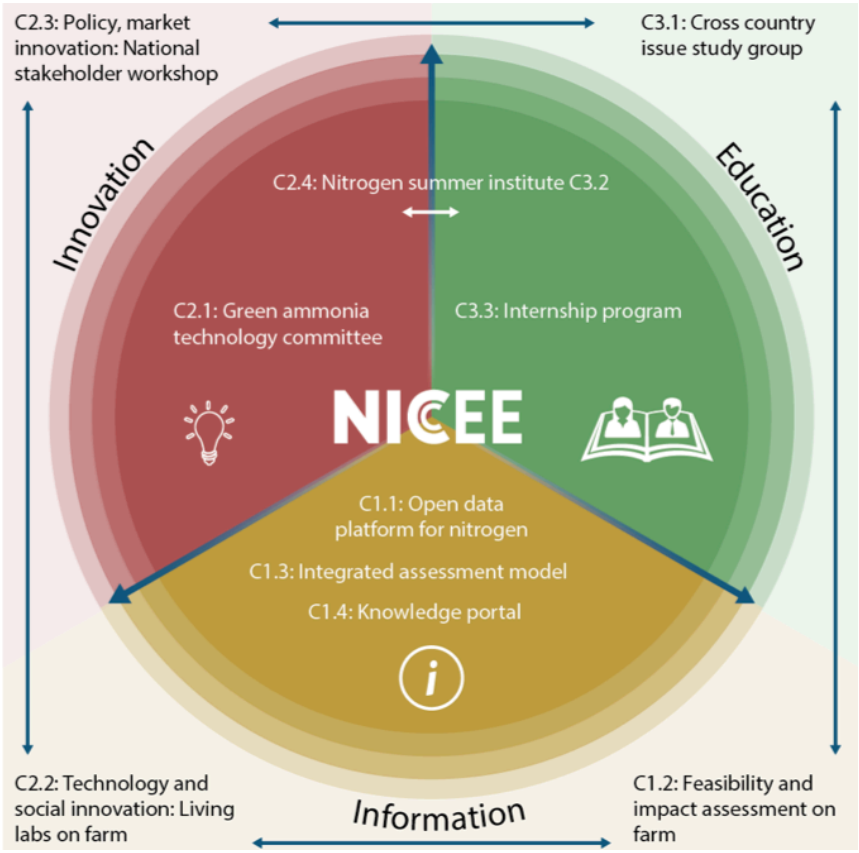


About NICCEE

The Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE) is a transdisciplinary and transnational network dedicated to advancing sustainable and climatesmart nitrogen (N) management through socioeconomic and technological innovation.

OUR MISSION: To enable and accelerate socioeconomic and technological innovation for **sustainable** and **climate-smart nitrogen management** with **use-inspired** and **data-driven approaches.**

INITIAL FOCUS: respond to the opportunities and challenges of **renewable-based nitrogen technologies** (*e.g.,* green ammonia) to provide clean energy and support food production while mitigating climate change.

Spearheaded by University of Maryland Center for Environmental Science (UMCES) with key partners in the US (New York University, University of Massachusetts Amherst), Canada (University of Guelph), and the U.K. (Rothamsted Research), Morocco (UM6P) and beyond, NICCEE is working to support sustainable nitrogen management across the globe. The NICCEE global community involves more than 25 partners across eight different countries, making connections across academia, NGOs, international organizations, government agencies, and private companies.

OUR VISION: NICCEE will serve as an **information hub** with state-of-the-art cyberinfrastructure to monitor the lifecycle and effects of nitrogen in agriculture-food-energy systems, an **innovation platform** to facilitate the co-development of technological and socioeconomic solutions with a broad spectrum of stakeholders, and an **education center** to nurture the next generation of scientists and innovators championing sustainable and climate-smart nitrogen management.

NICCEE will establish itself as a global leader and knowledge source on the impact of renewable-based nitrogen on nitrogen flows in agriculture and energy economies.

NICCEE is jointly funded by the US National Science Foundation (NSF) under award no. 2330502, the Natural Sciences and Engineering Research Council of Canada (NSERC-CRSNG) under award no. ALLRP 585018 - 23, UK Research and Innovation–Engineering and Physical Sciences Research Council (UKRI-EPSRC) under award no. EP/Y025776/1.

NICCEE Community Guidelines

NICCEE is committed to providing **a safe and brave space for individuals, groups and communities to collaborate, innovate, and respond to the challenges and opportunities of green ammonia.**

Please respect the diversity of our community and be generous of others' views. We do not tolerate personal attacks, harassment of any kind, intimidation, violence, or disruptive behavior. NICCEE is dedicated to fostering a welcoming and inclusive environment that promotes collaboration, constructive dialogue, and intellectual integrity.

See *Appendix A* for the complete NICCEE Principles of Conduct.

A Note from NICCEE’s Director

One of the most shocking facts many of us learned together in real time this year is that about **a quarter** of globally traded nitrogen fertilizer passes through the narrow Strait of Hormuz. At the same time, nearly one-fifth of the world's liquefied natural gas (LNG), a critical feedstock and energy source for nitrogen fertilizer production, also moves through this strategic chokepoint. The vulnerability of this narrow waterway serves as a stark reminder of how dependent modern food systems are on fragile global supply chains.

Nitrogen fertilizer is more than a commodity. It is a lifeline for many farmers and for the billions of people whose food depends on it. As a result, nitrogen management is not only an agronomic or environmental challenge. Increasingly, it is also a question of resilience, economic stability, geopolitics, and national security.

How can we produce nitrogen fertilizers using domestically available energy resources, particularly renewable sources such as solar and wind? How can we make better use of the nitrogen resources already available within our agricultural systems? How can we design food, energy, and environmental systems that are both productive and resilient in an increasingly uncertain world?

These questions sit at the heart of NICCEE's mission. Through advances in green ammonia, distributed fertilizer production, nutrient recycling, data-driven decision support, and more efficient nitrogen management, we seek to accelerate innovation across the agriculture–food–energy system.

The path forward will not be easy. Transformative innovation rarely follows a straight line. New technologies bring new opportunities, but also new uncertainties. Progress requires us to move beyond incremental improvements and ask bigger questions about the systems we are trying to build.

That is why we are here. Challenges create opportunities for discovery. Barriers demand creativity. Addressing the world's most pressing problems will require new ideas, new partnerships, and the courage to think beyond conventional boundaries. Over the next few days, I encourage you to engage deeply, explore bold ideas, and connect with colleagues across disciplines, sectors, and countries. Some of the most important innovations begin with a conversation that would not otherwise have happened.

Together, we have an opportunity to help shape a future where nitrogen supports food security, environmental sustainability, energy resilience, and human well-being.

Thank you for being part of this journey.

Xin Zhang, PhD
Director, Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE)
Professor, University of Maryland Center for Environmental Science
Editor, Earth’s Future (AGU)

Global Center Leadership

Global Advisory Board

Luis Lassaletta (Lead), CEIGRAM-Universidad Politécnica de Madrid
Andrew Bell, North Devon UNESCO Biosphere
Shabtai Bittman, Agriculture and Agri-Food Canada
Achim Dobermann, International Fertilizer Association
Alison Eagle, Environmental Defense Fund

Executive Committee

Xin Zhang (Director, US Lead), UMCES
Claudia Wagner-Riddle (Canada Lead), University of Guelph
Adrian Collins (UK Lead), Rothamsted Research
Eric Davidson, UMCES
Lora Harris, UMCES
Matthew Houser, UMCES, The Nature Conservancy
David Kanter, NYU
Nianqiang (Nick) Wu, UMass Amherst

Nitrogen Summer Institute organization

Sarah Garvey, NICCEE Program Manager, UMCES
Jordan Minigan, Research Program Coordinator, University of Guelph

Shared Event Resources

We created a shared folder for resources to support your participation throughout the 2026 Nitrogen Summer Institute, including the meeting program, breakout group notes, the NICCEE Principles of Conduct, and more.

Access it here or scan the QR code.

NICCEE's Root Document

A central document containing core NICCEE resources, including NICCEE's mission, funding acknowledgement, partner resources, links to forms and folders, and more!

Access it here or scan the QR code.

At-A-Glance

Monday, June 15, 2026 (*Optional field trip*)

8:15 AM	Shuttle pickup #1 at Fairfield Inn.
8:30 AM	Shuttle pickup #2 at Delta Hotel.
9:30 AM - 4:15 PM	Tour stops include Sollio Agriculture at Hamilton Port, Campden Grains, Harrcroft Acres, and lunch.
4:45 PM - 5:00 PM	Shuttle drop off at Fairfield Inn and Delta Hotel.

Tuesday, June 16, 2026

8:30 AM - 9:00 AM	**Introductions & Kick-off Ice Breaker**
9:00 AM - 9:50 AM	**Welcome & Keynote**
9:55 AM - 10:05 AM	**Community Expectations**
10:30 AM - 12:15 PM	**Session 1: Nitrogen Management in Agriculture in the US, Canada and UK**
12:15 PM - 1:15 PM	Lunch *(provided)*
1:15 PM - 3:00 PM	**Session 2: Green Ammonia for Farmers: Technical Adoption Roadmap**
3:30 PM - 5:00 PM	**Poster Session**
6:00 PM	Welcome dinner

Wednesday, June 17, 2026

9:00 AM - 9:30 AM	**Opening Remarks**
9:30 AM - 11:00 AM	**Catalyst Lab**
11:15 AM - 12:15 PM	**Plenary Discussion**
12:15 PM - 1:15 PM	Lunch *(provided*)
1:15 PM - 2:45 PM	**Session 3: Governance & Deployment Pathways for Green Ammonia in North America**
3:00 PM - 4:30 PM	**Session 4: The "N-Solutions" Explorer - Development Activity**
4:30 PM - 5:00 PM	**Reflections & Next Steps**

Meeting Schedule

Monday, June 15, 2026

Optional field trip.

8:15 AM	Shuttle pickup #1 at Fairfield Inn. 35 Cowan Place, Guelph, ON, N1G 0C1
8:30 AM	Shuttle pickup #2 at Delta Hotel. 50 Stone Road W, Guelph, ON, N1G 0A9
9:30 AM - 10:45 AM	**Sollio Agriculture at Hamilton Port (Pier 25 North)** 199 Eastport Boulevard (Pier 25 N), Hamilton, ON, L8H 7S3
11:15 AM - 12:00 PM	**Campden Grains** 4201-4399 Moyer Road, Campden, ON, L0R 1G0
12:15 PM - 1:45 PM	Lunch
3:30 PM - 4:15 PM	**Harrcroft Acres** 7812 Side Road 5, Fergus, ON, N1M 2W3
4:45 PM	Shuttle drop off #1 at Delta Hotel. 50 Stone Road W, Guelph, ON, N1G 0A9
5:00 PM	Shuttle drop off #2 at Fairfield Inn. 35 Cowan Place, Guelph, ON, N1G 0C1

Tuesday, June 16, 2026

Royal City Ballroom A
Delta Hotels Guelph Conference Centre
50 Stone Rd W, Guelph, ON N1G 0A9, Canada

8:00 AM - 8:30 AM	Guest arrival and check-in *(Coffee & light breakfast provided)*
8:30 AM - 9:00 AM	**Introductions & Kick-off Ice Breaker**
9:00 AM - 9:50 AM	**Welcome & Keynote** *Welcome* **Jessica Bowes**, Office of the Vice-President, Research and Innovation, University of Guelph **Claudia Wagner-Riddle,** NICCEE Canada-Lead; Professor, University of Guelph *Keynote* **Anne-Marie Chapman**, Director Research, Development and Technology, Agriculture and Agri-Food Canada **Cassandra Loomans**, Vice President, Sylvite

9:50 AM - 9:55 AM **General Announcements**

Sarah Garvey, NICCEE Program Manager, University of Maryland Center for Environmental Science

9:55 AM - 10:05 AM **Community Expectations**

Lora Harris, Professor, University of Maryland Center for Environmental Science

10:05 AM - 10:15 AM Group Photo

10:15 AM - 10:30 AM Coffee Break

10:30 AM - 12:15 PM **Session 1: Nitrogen Management in Agriculture in the US, Canada and UK**

Nitrogen management in agriculture and green ammonia in NICCEE's three deep-dive countries, the US, Canada and the UK. Agricultural practices, environmental impacts, policy contexts, and opportunities/barriers for green ammonia adoption.

10:30 AM - 11:10 AM *Presentation Series*
Please hold questions for the Questions & Discussion period.

Claudia Wagner-Riddle, NICCEE Canada-Lead; Professor, University of Guelph

Adrian Collins, NICCEE UK-Lead; Science Director, Rothamsted Research

Xin Zhang, NICCEE Director; Professor, University of Maryland Center for Environmental Science

Moderator:
Luis Lassaletta, Associate Professor, Universidad Politécnica de Madrid

11:10 AM - 11:25 AM *Questions & Discussion*

11:25 AM - 12:15 PM *Breakout Discussion*

Breakout Prompts:
1. Given what you just heard, what are the critical next steps for your core function team?
2. How can NICCEE better meet the described regional needs?
3. What opportunities are there for co-development between the UK, US and Canada?

Breakout Leaders:
1. Dong Liang - Information (*Pink*)
2. Graham McDonald - Information (*Red*)
3. Andrew Elmore - Information (*Orange*)
4. Mario Tenuta - Innovation (*Yellow*)
5. David Layzell - Innovation (*Green*)
6. David Kanter - Innovation (*Blue*)
7. Lora Harris - Education (*Purple*)

Notetakers:
1. Taehoon Kim - Information (*Pink*)
2. Nirmani Ranathuinga - Information (*Red*)
3. Margaux Alfare - Information (*Orange*)

4. Chi Vi - Innovation (*Yellow*)
5. Henry Bourret - Innovation (*Green*)
6. Navdeep Saini - Innovation (*Blue*)
7. Dilrukshi Kombala Liyanage - Education (*Purple*)

12:15 PM - 1:15 PM Lunch *(provided)*

1:15 PM - 3:00 PM **Session 2: Green Ammonia for Farmers: Technical Adoption Roadmap**

What would jumpstart distributed green ammonia in agriculture? Defining technical, experimental, and financial pathways for smallholders. Moving beyond high-level discussion to develop a practical technical adoption roadmap that connects production technologies, conversion pathways, and on-farm application needs. Anticipated regional foci include: Canada, India, SSA, Mexico, UK.

1:15 PM - 2:10 PM *Presentation & Panel Series*

Presentations:
Mario Tenuta, Senior Industrial Research Chair in 4R Nutrient Management and Professor, University of Manitoba

Smriti Kala, Senior Scientist, International Fertilizer Development Center [*virtual*]

Panel:
Noha El-Ghobashy, Co-CEO, Institute for Transformative Technologies

Samuel Njoroge, Scientist, African Plant Nutrition Institute

Tek Bahadur Sapkota, Principal Scientist, International Maize and Wheat Improvement Center (CIMMYT)

Laura Cardenas, Principal Research Scientist, Rothamsted Research

Moderator:
Eric Davidson, Professor Emeritus, University of Maryland Center for Environmental Science

2:10 PM - 2:40 PM *Breakout Discussion*

Breakout Prompts:
Select the corresponding question for your breakout group below. Use the accompanying table of green ammonia-based fertilizer products and pathways to farm adoption to assist your discussion.

- *Pink & Red*: **Technological gaps & making new connections**
- *Orange*: **Leveraging existing connections and technologies (India)**
- *Yellow*: **Leveraging existing connections and technologies (SSA)**
- *Green*: **Leveraging existing connections and technologies (Mexico/Latin America)**
- *Blue*: **Leveraging existing connections and technologies (US/Canada)**
- *Purple*: **Leveraging existing connections and technologies (UK/Europe)**

1. **Technological gaps & making new connections** - Many technologies are currently "stranded" because there is no technical bridge to the user (e.g., green ammonia produces anhydrous, but farmers use a range of different fertilizers).
    - What are the technical pathways to connect production technologies and opportunities for use/adoption?
    - What are the new use cases to connect product and user?

2. **Leveraging existing connections and technologies (regionally specific)** - Some connections from production to user exist but are limited, not standard, or adoption is stalled by the "Last Mile."
    - What options are there to move toward adoption in your region?
    - How can stakeholder perspectives inform adoption pathways?
    - Select 1-3 fertilizer products to focus on, and evaluate feasibility, gaps, relevant approaches.

Breakout Leaders:

1. Thomas Hamann (*Pink*)
2. David Layzell (*Red*)
3. Noha El-Ghobashy (*Orange*)
4. Samuel Njoroge (*Yellow*)
5. Tek Bahadur Sapkota (*Green*)
6. Rachel Opitz (*Blue*)
7. Yusheng Zhang (*Purple*)

Notetakers:

1. Yujing Gao (*Pink*)
2. Michelle Gareau (*Red*)
3. Dilrukshi Kombala Liyanage (*Orange*)
4. Sophie LeClaire (*Yellow*)
5. Zitong Li (*Green*)
6. Jun Suk Byun (*Blue*)
7. Agustin Olivo (*Purple*)

2:40 PM - 3:00 PM — *Large Group Feedback*
Each group is invited to share for 2-3 minutes.

Moderator:
Eric Davidson, Professor Emeritus, University of Maryland Center for Environmental Science

3:00 PM - 3:30 PM — Coffee Break

3:30 PM - 5:00 PM — **Poster Session**

NICCEE collaborators from all sectors, disciplines and career stages are invited to share their current work in a poster session format. This session will be a relaxed space to network, explore the diversity of nitrogen research in agri-energy-food systems, and identify new questions and gaps in knowledge.

6:00 PM — **Welcome Dinner**

Beertown Public House
433 Stone Rd W Unit 8, Guelph, ON N1G 2X6, Canada

Wednesday, June 17, 2026

Royal City Ballroom A
Delta Hotels Guelph Conference Centre
50 Stone Rd W, Guelph, ON N1G 0A9, Canada

8:00 AM - 9:00 AM Guest arrival and check-in
(Coffee & light breakfast provided)

9:00 AM - 9:30 AM **Opening Remarks**

Welcome & Reminders
Sarah Garvey, NICCEE Program Manager, University of Maryland Center for Environmental Science

Reflections from Day 1
Graham MacDonald, *Associate Professor, McGill University*

9:30 AM - 11:00 AM **Catalyst Lab**

Led by early career scientists and organized by Lora Harris (Professor, UMCES), the Catalyst Lab is a student-facilitated, interactive session designed to spark creativity and collaboration across disciplines and sectors. This session will focus on sharing perspectives from the farm scale and reflect on co-production workshops held in the United States and Canada.

11:00 AM - 11:15 AM Coffee Break

11:15 AM - 12:15 PM **Plenary Discussion**

Reflection on key cross-working opportunities and priorities for NICCEE activities.

Moderators:
Adrian Collins, NICCEE UK-Lead; Science Director, Rothamsted Research

Claudia Wagner-Riddle, NICCEE Canada-Lead; Professor, University of Guelph

Xin Zhang, Professor, University of Maryland Center for Environmental Science

12:15 PM - 1:15 PM Lunch *(provided*)

1:15 PM - 2:45 PM **Session 3: Governance & Deployment Pathways for Green Ammonia in North America** (*part 1*)

Explore future scenarios for green ammonia adoption and identify governance pathways from a scientific perspective.

1:15 PM - 1:40 PM *Presentation Series*
David Kanter, Associate Professor, New York University

Valentina Roel, Postdoctoral Researcher, New York University [*virtual*]

1:40 PM - 2:10 PM *Breakout Discussion*

Breakout Prompts:

All groups should answer the first “ALL GROUPS” question. Then, select the corresponding follow-up question for your breakout group.

- *ALL GROUPS*: Do the 5 scenarios reflect an appropriate range of ammonia futures?
- *PINK & RED*: What policy instruments and mixes might underpin more ambitious green ammonia scenarios?
- *ORANGE & YELLOW*: What methods are best suited to assessing environmental and socioeconomic impacts?
- *GREEN & BLUE*: What stakeholder voices are missing from the room and what insight could they bring?

Breakout Leaders:

1. William San Martin (*Pink*)
2. Alison Eagle (*Red*)
3. Luis Lassaletta (*Orange*)
4. Suprem Das (*Yellow*)
5. Josh McBee (*Green*)
6. David Kanter (*Blue*)
7. Tongzhe Li (*Purple*)

Notetakers:

1. Yujing Gao (*Pink*)
2. Bilal Javed (*Red*)
3. Dong Liang (*Orange*)
4. Henry Bourret (*Yellow*)
5. Margaux Alfare (*Green*)
6. Agustin Olivo (*Blue*)
7. Michelle Gareau (*Purple*)

2:10 PM - 2:45 PM *Large Group Feedback & Open Discussion*
Each group is invited to share for ~2-3 minutes, followed by open, large group discussion.

Moderator:
David Kanter, Associate Professor, New York University

2:45 PM - 3:00 PM Coffee Break

3:00 PM - 4:30 PM **Session 4: The "N-Solutions" Explorer - Development Activity**

Following a multi-sector panel spanning research, industry and governance, attendees will participate in an interactive exercise evaluating technology, policy, and management interventions across the agri-food-energy nexus.

3:00 PM - 3:40 PM *Presentation & Panel Series*
Field Trip Recap:
Tom Bruulsema, Chief Scientist, 4RPN Consulting

Panel:
Suprem Das, Associate Professor, Kansas State University

Shabtai Bitmann, Research Scientist, Agriculture and Agri-Food Canada

Eric A. Davidson, Professor Emeritus, University of Maryland Center for Environmental Science; Principal Scientist, Spark Climate Solutions

Rachel Opitz, Program Manager, Taylor Geospatial

Moderator:
Adrian Collins, NICCEE UK-Lead; Science Director, Rothamsted Research

3:40 PM - 4:10 PM *Breakout Discussion*

Breakout Prompts:
As a breakout group, target intervention points (technology, policy, management and beyond—including but not limited to green ammonia). Use the accompanying figure to support your discussion and address the following:

- Outline the target intervention and problem it addresses
- Key stakeholders / relevant audience for this intervention
- Efficacy metrics to evaluate this intervention (what data is needed to support/persuade farmers, policymakers, investors, etc.)
- Environmental & system effects
- Barriers
- Overall assessment: Recommended, Promising, Still Developing, or Not Recommended

Breakout Leaders:

1. Luis Lassaletta (*Pink*)
2. Eric Davidson (*Red*)
3. Thomas Hamann (*Orange*)
4. William San Martin (*Yellow*)
5. Josh McBee (*Green*)
6. Suprem Das (*Blue*)
7. Thomas Bruulsema (*Purple*)

Notetakers:

1. Nirmani Ranathuinga (*Pink*)
2. Zineb El Gorai (*Red*)
3. Jun Suk Byun (*Orange*)
4. Anikka Fife (*Yellow*)
5. Colin Elgie (*Green*)
6. Bilal Javed (*Blue*)
7. Sophie LeClaire (*Purple*)

4:10 PM - 4:30 PM *Large Group Feedback*
Each group is invited to share for ~2-3 minutes.

Moderator:
Adrian Collins, NICCEE UK-Lead; Science Director, Rothamsted Research

4:30 PM - 5:00 PM **Reflections & Next Steps**

Xin Zhang, NICCEE Director; Professor, University of Maryland Center for Environmental Science

Poster Session

A Scientific Roadmap for Advancing Agricultural Nitrous Oxide MMRV and Modeling

A. Woodley[1], A. Huddell[2], A. Riaz[3], B. Buma[4], C. Smith[5], C. Kelly[6], C. Nevison[7], D. Kanter[8], D. “Doc” Brown[9], E. Stuchiner[7], E.A. Davidson[10, 11], E. Kort[12], G. Plant[13], J. Franch[14], J. Deng[15], K. Sun[3], K. Todd-Brown[16], M. Houser[10], M. Hong[17], N. Reinke[18], P. Vadas[19], R. Gurung[17], R. Thompson[20], S. Garvey[10], S.E. Brown[21], S. Ogle[17], X. Zhang[10], R. Opitz[18], D. Rath[22] and M. Kaplan[22]

[1]NCSU, [2]University of Delaware, [3]SUNY Buffalo, [4]EDF, [5]UCDavis/UCANR, [6]Corteva, [7]University of Colorado, [8]NYU, [9]PACT, [10]UMCES, [11]Spark Climate Solutions, [12]MPIC, [13]University of Michigan, [14]Jane Franch Strategic Consulting & Advisory, [15]University of New Hampshire, [16]University of Florida, [17]Colorado State University, [18]Taylor Geospatial, [19]USDA, [20]NILU, [21]University of Saskatchewan, [22]NRDC

Nitrous oxide (N_2O) is the most potent agricultural greenhouse gas and a leading driver of stratospheric ozone depletion, yet the systems needed to reliably measure, monitor, report, and verify (MMRV) agricultural N_2O emissions remain fragmented, expensive, and inconsistently applied. This poster presents a community-developed scientific roadmap for advancing agricultural N_2O MMRV and modeling, authored by more than 25 researchers, practitioners, and policy experts spanning academia, federal agencies, and the private sector.

The roadmap synthesizes a community-consensus set of ten research and infrastructure priorities, spanning instrumentation, data systems, and modeling. Instrumentation priorities include developing cheaper, more portable sensors and novel measurement approaches such as active lidar, chemi-resistive sensors, and microelectromechanical systems. Data infrastructure priorities center on adherence to FAIR principles, coordinated multi-site measurement networks, and pipelines that move N_2O data efficiently to modelers and technical assistance providers. Modeling priorities include systematic model intercomparison and the integration of process-based domain knowledge with machine learning architectures.

The roadmap connects these recommendations to high-value use cases where improved N_2O MMRV would unlock substantial economic and climate co-benefits: voluntary carbon offset markets, corporate Scope 3 supply-chain emission management, and the alignment of agricultural incentives and regulations with on-farm practice. The roadmap is intended as a strategic coordination tool for funders, policymakers, and researchers seeking to align investments around robust, science-based N_2O measurement.

Remote Sensing of Ammonia Emission and Estimation of Livestock Manure’s Contribution to Minnesota’s Nitrogen Budget

D. Liang[1], C. Dai[2], K. Sun[3], A. Elmore[2], X. Zhang[2]

[1] Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, [2] Appalachian Laboratory, University of Maryland Center for Environmental Science, [3] Department of Civil, Structural, The State University of New York, University at Buffalo

Synthetic nitrogen N fertilizer application, and livestock manure are major sources of gaseous emission of ammonia. Detailed enumeration of the livestock systems and fertilizer applications from individual farmers is usually precise on the fine spatial scale, but the availability of the data is scattered. The ammonia emission can be measured by modern satellite sensors or micrometeorological towers. We synthesized these emission data from various spatial and temporal scales. Satellite column concentrations show general spatial and temporal coherence with the livestock production in Minnesota, US, and the tall tower measurements. These data suggest that ammonia emission data can be useful to quantify nutrient budgets at higher spatial resolution. Such a high-resolution nutrient budget can be useful in engaging the stakeholders with more accurate and timely information for nutrient management.

Satellite-constrained nationwide attribution of U.S. agricultural ammonia emissions

Z. Li[1,2], K. Guan[1,2,3,4] *, K. Sun[5,6], S. Wang[1,2]

[1] Agroecosystem Sustainability Center, Institute for Sustainability, Energy, and Environment, University of Illinois Urbana-Champaign, [2] Department of Natural Resources and Environmental Sciences, College of Agricultural, Consumer and Environmental Sciences, University of Illinois Urbana-Champaign, [3] National Center for Supercomputing Applications, University of Illinois Urbana-Champaign, [4] Department of Computer Science, University of Illinois Urbana-Champaign, [5] Department of Civil, Structural and Environmental Engineering, University at Buffalo, [6] Research and Education in Energy, Environment and Water Institute, University at Buffalo

Ammonia (NH_3) is a key contributor to atmospheric nitrogen pollution, influencing particulate matter formation, nitrogen deposition, and human health. However, national emission estimates remain highly uncertain due to dependence on bottom-up inventories that parameterize emissions without direct observational constraint. Here we develop a satellite-constrained framework to attribute agricultural NH_3 emissions by source sectors across the contiguous United States. Using satellite NH_3 observations from the Infrared Atmospheric Sounding Interferometer (IASI) and Cross-track Infrared Sounder (CrIS), emission fluxes are derived with a directional derivative approach at 0.1° resolution. Source-emission relationships are empirically derived in source-dominant regions, linking emissions to fertilizer nitrogen inputs for crops and livestock populations for animal systems. Environmental variables, including temperature, precipitation, and wind, are incorporated to assess how meteorological conditions regulate NH_3 volatilization and transport. Satellite-derived emissions reveal strong spatial concentration in intensive agricultural regions and differences from the existing U.S. Environmental Protection Agency (EPA) National Emissions Inventory (NEI) estimates. Cropland emissions are primarily driven by fertilizer inputs and modulated by temperature and transport, whereas livestock emissions exhibit distinct regimes, including precipitation-sensitive grazing systems and animal-dominated feedlots. These results demonstrate that agricultural NH_3 emissions are driven by system-specific interactions between management and environmental conditions. Satellite observations provide an independent constraint on nitrogen emissions and enable nationwide source attribution, offering new insights to improve emission inventories and support air quality management.

From Farm Survey Data to Regional-Scale Nitrogen Management

B. Javed and G. K. MacDonald

Regional nitrogen assessment requires crop-specific information on where fertilizer is applied and how it is managed. Farm survey data can provide this information, but respondent locations are often approximate, which makes it difficult to link to digital crop maps and other geospatial data. Here, we developed a geospatial workflow to convert responses from Fertilizer Canada's Fertilizer Use Survey (FUS) for 2021-2024 into nitrogen management layers across major Canadian grain and oilseed regions. This includes grain corn and soybeans in eastern Canada and canola, spring wheat, and barley in western Canada. We cleaned and harmonized survey records, linked them to geocoded postal-code locations, and assigned each respondent record to the H3 hexagon-based discrete global grid system (DDGS) at ~250 km2area (H3-5). After aggregation, the observed FUS data contributed 4,551 unique crop-year H3-5 records across 913 H3-5 cells. We then linked records with satellite-derived AAFC Annual Crop Inventory (ACI) layers to confirm that the FUS target-crop was present and to define the crop-specific agricultural extent. Since FUS coordinates are approximate, we are conducting additional quality control using Google Earth to compare the geocoded latitude/longitude with postal code boundaries and high-resolution satellite imagery. Results were then scaled regionally using ACI-derived crop growing areas and a hierarchical local gap-filling approach, producing a mapped crop-present grid of 30,504 crop-year records across 4,510 unique H3-5 cells. The final products include crop-specific nitrogen-rate maps that incorporate dominant management practices 'bundles', including fertilizer timing, placement, source, and add-on practices such as the use of nitrification inhibitors or manure. Together, these outputs provide a transparent foundation for regional nitrogen assessment and future model input development.

Keywords: nitrogen management, farm survey, H3 hexagons, annual crop inventory, fertilizer use.

Multi-model assessment of field-scale nitrogen fertilizer impacts under different agricultural systems in the UK, Canada and the USA

Y. Zhang[1], K. N. Ranathunga[2], A. J. Olivo[2], Y. Gao[3], C. Wagner-Riddle[2], X. Zhang[3] and A. L. Collins[1]

[1]Rothamsted Research. [2]School of Environmental Sciences, University of Guelph. [3]University of Maryland Center for Environmental Science

Agriculture is a major source of reactive nitrogen (N) losses through nitrate (NO_3^-) leaching and runoff to the hydrosphere, ammonia (NH_3) volatilization and nitrous oxide (N_2O) emissions to the atmosphere. Fertilizer N application in croplands is a significant contributor to these losses and is also influenced by other factors, including climate, soils, and management practices, such as fertilizer timing, placement, type, and rate of application. Process-based agroecosystem models can be used to better understand the drivers of field N losses associated with variable environmental conditions and fertilizer management in a diversity of agroecosystems, to ultimately help mitigate these impacts. However, depending on the model, limitations exist, including the inability to characterize field conditions and management, the simplification of crop parameters, and limited representation of novel fertilizer products and their nitrogen constituents. To reduce model uncertainty in simulations, multi-model ensembles provide a promising approach over individual models, thereby increasing the applicability of results under diverse management and environmental conditions.

This study creates a three-model ensemble by calibrating three process-based models including SPACSYS, DSSAT, and DNDCv.CAN with three field experimental datasets in the UK, Canada, and the USA. The overarching goal is to investigate and compare the models ability to simulate N losses (N_2O, NO_3^-) and crop productivity at the field scale across locations with different soils, climates, and cropping systems. We will present an overview of the modelling approach, the preliminary results for the UK site, and ongoing activities.

Projecting the effects of climate change on nitrous oxide (N_2O) emissions from agroecosystems globally

H. Song[1,2], G. K. MacDonald[1], K. Jan van Groigen[3], T. Kim[1], H. Tian[4], and C. Peng[2]

[1] McGill University, [2] University of Quebec, [3] University of Exeter, [4] Boston College

Improved understanding of how nitrous oxide (N_2O) emissions from global terrestrial ecosystems will respond to climate change is needed to inform science-based decision making around climate mitigation. Here, we compiled a comprehensive dataset of in-situ experiments worldwide and applied a process-based model, TRIPLEX-GHG, to quantify the combined effects of climate change and elevated atmospheric CO_2 concentrations on global N_2O emissions. Field warming significantly increased N_2O emissions (+9.2% per 1 °C warming), with responses largely regulated by warming intensity, external nitrogen inputs, and experimental duration. In contrast, N_2O emissions are less sensitive to elevated CO_2 concentrations (+5.2% per 100 ppm increase). Our projections indicate that combined climate change and elevated CO_2 effects could substantially enhance N_2O emissions from global agroecosystems by 0.32 – 0.65 Tg N_2O-N yr^{-1} this century, equivalent to about 5 – 10% of current emissions. Croplands contribute most consistently to this increasing trend due to external N inputs, whereas managed grasslands, including pasture and rangeland, could have neutral to negative responses to these changes depending on their management intensity. Overall, our findings suggest that climate inequity would be amplified due to the imbalanced responses of N_2O emissions to climate change between developing and advanced economies. Our study underscores the need for geographic redistribution of agricultural N inputs to reduce imbalances and to specify the role of N_2O emissions within Nationally Determined Contributions (NDCs) to mitigate future emissions while addressing global climate inequity.

Decarbonizing US fertilizer production with distributed renewable-based ammonia

Y. Gao[1,2], E. A. Davidson[1,2,3], X. Zhang[1,2] *

[1] Appalachian Laboratory, University of Maryland Center for Environmental Science, [2] Global Nitrogen Innovation Center for Clean Energy and the Environment, [3] Spark Climate Solutions
* Corresponding author: xin.zhang@umces.edu

Ammonia fertilizer production is a carbon-intensive foundation of modern agriculture, yet its decarbonization potential varies strongly across regions and fertilizer products. This study evaluates county-level adoption potential for distributed renewable-based ammonia (DRA) in the United States by integrating fertilizer demand, cropland scale, renewable energy capacity, fertilizer prices, and farm application infrastructure. We focus on two near-term substitution pathways: replacing conventional anhydrous ammonia and replacing nitrogen solutions with aqua ammonia derived from DRA-produced ammonia. Results show that 48% of anhydrous ammonia use and 41% of nitrogen solution use occur in counties meeting baseline criteria for modular DRA deployment, together representing 22% of total US fertilizer consumption and an estimated 5.5 Mt CO2 yr-1 mitigation potential. Counties with the highest adoption potential are concentrated primarily in the Midwest and Great Plains, where fertilizer demand and farm readiness overlap. The largest current barrier is insufficient local renewable energy capacity, followed by lack of economic incentive and, for nitrogen solutions, limited liquid-application infrastructure. Expanding local renewable capacity could substantially increase feasible substitution and raise mitigation potential above 10 Mt CO2 yr-1. These results provide a spatial targeting framework for prioritizing early DRA deployment and guiding investment toward a lower-carbon fertilizer system.

Technoeconomic Assessment of Low Carbon Nitrogen Fertilizer Production Technologies and their Adaptability across Global Farming Systems

J. S. Byun

University of Maryland Center for Environmental Science

Global nitrogen fertilizer production is highly centralized and fossil-dependent, with 407 facilities responsible for 1.3% of global CO2 equivalent emissions and approximately 120 countries dependent on imports. Transitioning to low carbon production and overcoming supply chain risks require navigating divergent market realities. Interviews with NGOs, fertilizer corporations, and startups were conducted to identify operational priorities towards this transition. The focus of corporations was on centralized carbon-capturing pathways to leverage economies of scale and maintain established supply chains. Startups focused on decentralized, renewable-powered modular production to lower capital barriers, while facing energy intermittency and production cost constraints. NGOs emphasized localized production to shield smallholders from severe inland logistics markups, while acknowledging challenges from urea-dependent agricultural systems.

To address corporation focus areas, carbon intensity and energy efficiency metrics were collected to contextualize centralized low carbon pathways against regulatory thresholds. To assess startup constraints, CAPEX, OPEX, renewable Levelized Cost of Energy, and solar and wind yields were mapped to understand the potentials for renewable-powered modular hubs. Addressing NGO priorities, inland logistics penalties were estimated through the spread between global import and retail farm-gate prices, suggesting decentralized production may provide a solution for the volatile fertilizer supply chain. Furthermore, national fertilizer product demand was analyzed to assess the agronomic carbon deficit hurdle when deploying low carbon technologies into urea dominant regions.

By aligning stakeholder constraints with technoeconomic data, this analysis aims to understand the current opportunities and barriers of low carbon N production technologies. This research has been conducted for the International Fertilizer Association.

Life cycle assessment of green, blue, and conventional ammonia fertilisers: A case study from the North Wyke Farm Platform, UK

A. Jebari, Y. Zhang and A.L. Collins

Rothamsted Research

Ammonia-based fertilisers are essential for global food production, yet conventional ammonia synthesis is heavily reliant on fossil fuels and is highly carbon-intensive. Green ammonia, produced using renewable energy, and blue ammonia produced using natural gas with carbon capture and storage, offer potential sustainable alternatives. However, comprehensive life cycle assessments (LCA), comparing green, blue and conventional production pathways remain limited.

This study is therefore assessing the environmental performance of green ammonia pathways (e.g., wind, hydropower) compared with conventional (grey) ammonia, and blue ammonia, by conducting a full-chain LCA. The analysis focuses on the potential deployment of distributed green ammonia plants for farming in the UK. A business-as-usual (grey ammonia) scenario is based on using high-resolution and wide-ranging recorded activity data from the North Wyke Farm Platform (NWFP) (a UK National Bioscience Resource Infrastructure; NBRI), which serves as the reference case for comparison with other production pathways. All data have been analysed using SimaPro 10.3 software, and the Environmental Footprint (EF) impact assessment method v3.1, developed by the European Commission.

Overall, green ammonia exhibited the lowest overall environmental impacts, particularly when powered by hydropower, due to its relatively lower infrastructure requirements. Blue ammonia reduced climate change impacts relative to conventional grey ammonia; however, increased energy demand and infrastructure requirements resulted in higher impacts across several non-climate environmental categories.

The study underscores the need to balance environmental performance with practical considerations of system design and deployment, ensuring that sustainability gains are realised without compromising energy efficiency, resource availability, operational feasibility or economic viability.

A Conceptual Framework: How Climate, Soil, and Crop Management Shape Maize Yield Response to Nitrogen

P. Wu[1,2], Z. Li[1,2], K. Guan[1,2], B. Peng[3]

[1] Agroecosystem Sustainability Center, University of Illinois Urbana-Champaign, [2] Department of Natural Resources & Environmental Sciences, University of Illinois Urbana-Champaign, [3] Department of Crop Sciences, University of Illinois Urbana-Champaign

Nitrogen (N) fertilization is fundamental to crop yield, soil fertility, and long-term environmental resilience. However, effective N fertilizer management remains challenging due to the complex interplay of soil properties, climate variability, and crop management on soil N dynamics and crop growth. Here, we developed an integrative conceptual framework to assess how soil N supply, loss, and crop N uptake are shaped by soil, climate, and crop management. Using 616 maize N-yield response experiments from 23 studies, we applied a random forest model to identify the dominant drivers of unfertilized yield, maximum yield, and optimum N fertilizer rate. Results indicate that crop rotation is the dominant driver: soybean-corn rotation improves soil N supply through increased mineralization, thereby reducing fertilizer N requirements. Regarding climate, excessive precipitation promotes N loss through leaching and reduces soil inorganic N availability, while inadequate precipitation limits crop N demand by suppressing growth. Among soil properties, pH emerges as a dominant driver with nuanced effects: neutral-to-alkaline soils enhance N mineralization and inorganic N supply, but simultaneously stimulate root function and crop N uptake, creating a trade-off in net fertilizer N requirement. Together, these findings highlight the importance of evaluating optimal N rates through the integrated lens of soil N supply, N loss, and crop N demand, and provide a foundation for guiding farmers in adjusting N rates to field- and year-specific conditions.

Keywords: nitrogen fertilizer management; Nitrogen use efficiency; Random forest; soil inorganic nitrogen

Reduced reliance on nitrogen inputs with long-term non-legume cover cropping

L. L. Van Eerd, S. Vink, I. Chahal, P. Musayidizi, Y. Peng.

School of Environmental Sciences, University of Guelph. Ridgetown Campus

Cover crops (CC) play an important role in improving soil organic matter (SOM) and nitrogen (N) cycling. Yet, directly linking enhanced N availability and crop yield gains under long-term cover cropping with SOM accrual remains a challenge, especially when commercial N fertilizer is applied. To address this research gap, we employed two long-term CC (LTCC) experiments established in 2007 and repeated in 2008 at Ridgetown, Ontario Canada. In this LTCC experiment, CC were annually planted in a horticulture-grain system where SOM accrual was observed. The LTCC treatments included no CC (NOCC) control, oat, winter cereal rye, radish, and a mixture of radish and rye, with four replications. From 2019 to 2023, a vegetable crop- CC- grain corn (Zea mays L.) were grown across four site-years with either 14 or 0 kg N ha-1 fertilizer applied. Our objectives were to assess corn yield and N status related to the LTCC-induced SOM accrual. Generally, optical sensor readings and plant tissue analysis showed greater in-season N uptake by corn under LTCC from the V6 stage onward, compared to NOCC. Moreover, LTCC had up to 43% greater grain yield (4-yr mean grain yield of 9.7 to 12.7 Mg ha-1 with LTCC compared to 9.1 Mg ha-1 without) and greater yield-stability index (except for Oat) than NOCC. Relative grain yields were positively correlated with surface 15 cm SOM concentrations (relative yield= 0.784[SOM]-0.006, R2=0.31, P=0.001, n=31). These robust findings confirmed that LTCC is a promising management strategy for improving N availability and crop productivity, primarily due to scavenging soil residual N and building up SOM.

Dead Tell No Tales: Soil Nitrogen Cycling Responds Only to Living Cover Crops

M. Maslov[1], M. Tenuta[1], and C. Drury[2]

[1] Department of Soil Science, University of Manitoba, [2] Agriculture and Agri-Food Canada

Cover crops are widely promoted as a strategy to reduce nitrous oxide (N_2O) emissions from agricultural soils; however, the relative contributions of living cover crops and their residues to soil nitrogen (N) cycling remain poorly understood. A field experiment was conducted from 2023 to 2025 at the Ian N. Morrison Research Farm near Carman, Manitoba, Canada, on an Orthic Black Chernozem (sandy loam). Treatments consisted of fall rye (Secale cereale L.) cover crops or bare soil, combined with no-till or conventional tillage and various N fertilizer management strategies, including split N applications and enhanced-efficiency fertilizers. Nitrous oxide emissions, soil mineral N dynamics, cover crop biomass, and corn yield were monitored throughout the study. Rye aboveground biomass varied substantially among years, with approximately fivefold lower biomass production during a cold, wet spring than during a warm, dry spring. Despite these contrasting growing conditions, living cover crops consistently reduced cumulative spring N_2O emissions by 40-47% relative to bare soil. This reduction was associated with lower soil nitrate concentrations, indicating that plant uptake of mineral N reduced substrate availability for microbial N_2O production. Notably, nitrate depletion occurred regardless of aboveground biomass production. In contrast, cover crop residues had no measurable effect on growing-season N_2O emissions or soil mineral N dynamics under either tillage system. Residues reduced corn grain yield only in unfertilized control treatments, suggesting greater competition for N between residue decomposition and crop uptake under N-limited conditions. These findings demonstrate that the environmental benefits of cover crops arise primarily from the activity of living plants rather than residue decomposition, emphasizing the importance of maintaining active cover crop growth to reduce N losses from agroecosystems.

Fall-Applied Pronitridine with Anhydrous Ammonia on Clay Soils: Effects on N2O Emissions, Yield, and Profitability in Corn and Canola

M. Proulx*, B. Sperling, and M. Tenuta

Department of Soil Science, University of Manitoba

Nitrogen stabilizers used with anhydrous ammonia (AA) have been challenging for farmers because nitrapyrin-based formulations are highly corrosive, can damage AA application equipment, or require investment in separate in-line injection systems to reduce premature wear. Formulations containing pronitridine has been commercialized as safe for AA equipment and stable under freezing conditions. Although several studies have reported reduced nitrogen losses in temperate climates, very limited data are available for the northern Great Plains, particularly for fall applications on clay soils. Therefore, our objective was to evaluate pronitridine in field-scale trials using farmer equipment.

In the first experiment, fall-applied AA at 100% and 85% N rates, with and without pronitridine, was compared with fall strip-till urea at the 100% N rate in grain corn. No significant yield differences were observed among treatments. However, AA applied at the 85% N rate with pronitridine was the most profitable strategy, returning approximately $68 ha-1 more than fall strip-till urea. Fall-applied urea also produced the greatest growing-season N2O emissions, 188% more than AA at 85%.

In the second experiment, AA applied at the 100% N rate early in the fall (soil temperature >10°C) or late in the fall (soil temperature <5°C), with and without pronitridine, was compared with spring mid-row banded urea at the 100% N rate for canola production. Significant yield differences were detected, with early fall-applied AA yielding 125 kg ha-1 more than spring-applied urea. Accordingly, fall-applied AA without pronitridine was the most profitable strategy, returning approximately $129 ha-1 more than spring mid-row banded urea. Spring-applied urea produced the greatest growing-season N2O emissions, 143% more than fall-applied AA.

Across both experiments, pronitridine did not reduce N2O emission or increase yield statistically but showed potential to improve profitability in corn under reduced N rates, while urea-based systems consistently generated greater N2O emissions than AA-based systems.

Evaluating the Mitigation Potential of Dual Inhibitors on Fertilizer-Derived Nitrous Oxide Emissions in Winter Wheat

M. T. Gareau, C. Wagner-Riddle, R. E. Farell, D. L. Burton

Synthetic nitrogen (N) fertilizer is essential for grain production, yet its intensified use has substantially increased nitrous oxide (N2O) emissions, a potent greenhouse gas with a global warming potential 273 times that of carbon dioxide. While growing-season N2O emissions are well documented, current annual N budgets lack resolution on fertilizer-derived versus soil-derived emission sources. Additionally, enhanced-efficiency N fertilizers with dual urease and nitrification inhibitors offer the potential to mitigate N2O emissions by synchronizing N availability with crop demand, thereby improving fertilizer N use efficiency and curbing overall N losses.

However, the specific impact of dual inhibitors on total and fertilizer-specific N2O emissions in an Ontario diverse grain rotation that includes winter-wheat remains unexplored. This ongoing study at the Elora Lysimeter Research Station evaluates the effect of dual inhibitors on cumulative N2O emission and the contribution of fertilizer to these emissions using large-scale lysimeters of two contrasting soils (silt loam and loamy sand) and 15N tracer. Since 2018, six lysimeters of each soil type have been managed under a three-year diversified rotation with winter wheat planted in fall 2025. In spring 2026, 5% 15N enriched urea ammonium nitrate was applied to wheat a rate of 120 kg N ha^{-1} to each soil type with and without dual inhibitor (3 replicates each). Following fertilization, surface and subsurface N2O and 15N2O samples are being collected using non-steady-state, manually sampled gas flux chambers and soil gas lances at 5, 10, 30, 60, and 90 cm depths. Here, preliminary results of fertilizer-derived and cumulative emissions after N fertilization will be presented.

Assessing the use of nitrification and urease inhibitors for reducing nitrate leaching from winter wheat

H. Bourret, C. Wagner-Riddle, K. Congreves, A. Berg

Over 80% of Canadian winter wheat production is grown in Ontario. During spring fertilizer application, large drainage events are common in Southern Ontario due to a water-budget surplus. This surplus makes nitrogen (N) fertilizer highly susceptible to leaching. Nitrification and urease inhibitor (NUI) fertilizer could mitigate spring loss, but has not been thoroughly assessed for N leaching. 15N traced fertilizer is an effective way to quantify the amount of N leached directly from the fertilizer application. The objective of this study is to assess the contribution of fertilizer N to N leaching during the winter wheat fertilizer application and to quantify the difference in N leaching between fields managed with urea ammonium nitrate (UAN) and UAN with NUIs. In spring 2026, 15N traced UAN will be mixed in solution with unlabelled UAN. The fertilizer will be applied on a 1 m2 weighing lysimeter during the winter wheat phase of a diverse crop rotation. There are 4 main treatments: 3 silt loam with NUI, 3 silt loam with UAN, 3 loamy sand with NUI, and 3 loamy sand with UAN. Approximately every 7 days, water samples will be collected at a depth of 90 centimetres from each lysimeter. One sample will be analyzed by colorimetric analysis. Leaching will be calculated by multiplying N concentration by cumulative drainage. 15N samples will be processed

using the micro-diffusion method, then analyzed using an isotope ratio mass spectrometry to determine the proportion of 15N fertilizer. Methods and previous winter wheat data will be presented.

Biological Nitrogen Fixation in cereals

N. Saini, K. Dunfield, M. Raizada, A. Dobermann

Biological nitrogen fixation (BNF) is often promoted as a sustainable way to reduce some amount of dependence on synthetic nitrogen fertilisers. Different microorganisms interact with plants in different ways to support nitrogen acquisition. For example, rhizobia form nodules on legume roots and supply nitrogen directly to the plant, while organisms such as Azospirillum and Herbaspirillum associate with non-legume crops through the rhizosphere or by colonising plant tissues. However, the contribution of these microorganisms to plant nitrogen nutrition varies greatly and depends on factors such as microbial strain, plant genotype, soil conditions and management practices. A major challenge is that many claims of BNF are based on indirect evidence. Some studies rely on acetylene reduction assays(ARA), yield increases or plant growth responses without clearly demonstrating that atmospheric nitrogen was fixed and transferred into the plant. In addition, some microbial inoculants marketed as nitrogen-fixing products may function primarily as plant growth-promoting rhizobacteria (PGPR), improving nutrient uptake or root growth rather than supplying significant amounts of fixed nitrogen. Therefore, we build on recent framework by Giller, 2025 and propose a simple approach for evaluating BNF claims. We argue that evidence should progress through three key steps: first, demonstrating that the microorganism can fix nitrogen; second, showing that the fixed nitrogen enters the plant; and third, confirming that the effect is consistent and repeatable under field conditions. We also propose a field evaluation pipeline that includes verifying inoculant viability and persistence, using direct measurements of nitrogen fixation, conducting adequately replicated agronomic trials, and testing across multiple environments. This framework can help researchers, industry, and regulators make more reliable assessments of microbial inoculants and support the development of evidence-based policies for their commercial use.

Understanding Participants' Experiences and Collaborative Innovation in the Living Lab Approach: A Case Study of the Living Lab – Ontario project

C. Vi[1], E. Nelson[2], and C. Wagner-Riddle[1]

[1] School of Environmental Sciences, University of Guelph, [2] Department of Sociology and Anthropology, University of Guelph

The Lower Fraser Valley of BC, Canada, is a densely populated peri-urban region with intensive agriculture activity and multiple land uses for people and nature. This study examined the nitrogen balance of this exemplary peri-urban region, delineated by mountains, ocean and an international border. Nitrogen (N) is imported to the agricultural ecosystem mainly as livestock feed (20.7kt/yr) and fertilizer (4.5 kt/yr). Nitrogen is imported to the urban ecosystem as food, fertilizer and pet/ horse feed (14.2 kt/yr). Some N is transferred from agricultural to urban ecosystem (6.7 kt/yr), mitigating need for food importation, but little urban waste is used in agriculture. Nitrogen is lost from both agricultural and urban ecosystems to fresh and marine waters (18.5 kt/yr) and to the atmosphere (9.5 kt/yr). None of the imported N (41.1 kt/yr; 15.8 kg/yr per capita) is currently exported back to source regions. Existing urban waste programs (combustion, composting) focus on cycling C, not N or P nutrients. The case study shows that nutrient imbalances in peri-urban regions, near vulnerable tidal and fresh water sheds, and vital airsheds with large human populations need to be addressed. Exporting waste N is expensive, although pelleted poultry litter seems the best candidate due to high nutrient density. New farm technologies and some current food consumption trends will help to mitigate nutrient surpluses in peri-urban regions, but further measures are needed.

Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE) - UK field trials - FIRST YEAR

Y. Guo, L. Cardenas, A. Carswell, B. Chatindo, S. Sheey-Ariff, S. Wood, A. Collins

Nitrogen losses of the potent greenhouse gas (GHG) nitrous oxide (N2O) and the air pollutant ammonia (NH3) associated with mineral N-fertiliser applications are important emission sources for the agriculture sector in the UK. Nitrous oxide and NH3 contributed 30 and 16% respectively toward the 2024 totals from the UK agriculture sector.

In this project we aimed to construct an innovation platform to facilitate the co-development of technological innovations associated with green ammonia, through implementation of living labs. These, a grassland and an arable trial, received 4 treatments: zero N, calcium ammonium nitrate (CAN) (YARA Bela AXAN), CAN + nitrification inhibitor (DMPP, 3,4-dimethylpyrazole phosphate), urea, urea + dual inhibitor (Alzon-neo-N: 2-NPT [1,2,4-triazol, urease inhibitor, UI] and MPA [3-methylpyrazole, NI]).

Measurements of soil N and C, gaseous emissions (GHG, and NH3), plant yield and nitrogen uptake, and soil physics (X-ray CT scanner) were carried out during the arable-growing season and year-round on the grassland.

The inhibitors effectively reduced N2O emissions only from the arable soil. NH3 emissions were reduced with the dual inhibitor relative to untreated urea at both sites. Preliminary soil scans show better pore connectivity in the grassland soil, whilst arable soils exhibited fragmented and locally disconnected pore networks. Measurements for a second year will provide us with further insights to explain the apparent contradictory effect of the inhibitors for N losses.

Conversion from improved pasture to arable exacerbates unintended environmental consequences: evidence from the North Wyke Farm Platform, UK

Y. Guo, A. L. Collins, Y. Zhang, A. Carswell, C. Segura, A. Mead, L. Olde, N. Loick, L. Cardenas

Grassland dominates agricultural land use in the UK, with intensively managed and rough-grazing grasslands comprising 60% of the agricultural area. The conversion of grassland to arable represents a significant land use change that can result in a suite of unintended consequences.

We examined three agricultural systems on the Rothamsted Research North Wyke Farm Platform: a permanent pasture monoculture, a high-sugar grass that was converted to arable cropping, and a mixed sward with the same high-sugar grass and white clover. Following conversion, emissions of carbon dioxide were reduced compared to pre-conversion conditions, but this reduction was not statistically significant as a result of temporal variability in carbon dioxide fluxes. This land use change also resulted in significant reductions in soil carbon, nitrogen and phosphorus of 41%, 41% and 61%, respectively, compared to levels before conversion. In addition, flow-weighted inorganic nitrogen concentrations in combined surface and subsurface runoff significantly increased following conversion, while flow-weighted concentrations of carbon export did not change. Both grasslands maintained relatively stable and higher concentrations of soil organic matter and nutrient contents (carbon, nitrogen, phosphorus) compared with the arable conversion. Our findings highlight the environmental risks associated with grassland conversion to arable cropping underscoring the importance of land use management strategies preserving existing grasslands.

The Problem of Nutrient Imbalances in Peri-urban Regions: Case Study In the Lower Fraser Valley of British Columbia, Canada

S. Bittman, D. Hunt

Agriculture and Agri-Food Canada

The Lower Fraser Valley of BC, Canada, is a densely populated peri-urban region with intensive agriculture activity and multiple land uses for people and nature. This study examined the nitrogen balance of this exemplary peri-urban region, delineated by mountains, ocean and an international border. Nitrogen (N) is imported to the agricultural ecosystem mainly as livestock feed (20.7kt/yr) and fertilizer (4.5 kt/yr). Nitrogen is imported to the urban ecosystem as food, fertilizer and pet/ horse feed (14.2 kt/yr). Some N is transferred from agricultural to urban ecosystem (6.7 kt/yr), mitigating need for food importation, but little urban waste is used in agriculture. Nitrogen is lost from both agricultural and urban ecosystems to fresh and marine waters (18.5 kt/yr) and to the atmosphere (9.5 kt/yr). None of the imported N (41.1 kt/yr; 15.8 kg/yr per capita) is currently exported back to source regions. Existing urban waste programs (combustion, composting) focus on cycling C, not N or P nutrients. The case study shows that nutrient imbalances in peri-urban regions, near vulnerable tidal and fresh water sheds, and vital airsheds with large human populations need to be addressed. Exporting waste N is expensive, although pelleted poultry litter seems the best candidate due to high nutrient density. New farm technologies and some current food consumption trends will help to mitigate nutrient surpluses in peri-urban regions, but further measures are needed.

Policy Brief: Green Ammonia for Farmers in Sub-Saharan Africa

S. LeClaire, S. M. Garvey, E. A. Davidson, X. Zhang

Fertilizer is essential to agricultural productivity and food security in Sub-Saharan Africa, yet reliance on imported fertilizer exposes farmers and governments to volatile global markets, high transportation costs, and recurring supply disruptions. While green ammonia technologies face barriers including upfront capital costs and infrastructure constraints, targeted investments, blended finance mechanisms, farmer training, and fertilizer policy reforms can expand local production capacity, reduce dependence on imports, and help build a more resilient and sustainable agricultural sector.

Participants

Setareh Alamdar
PhD candidate, University of Guelph

I'm a PhD candidate in Environmental sciences at university of Guelph. The focus of my research is on application of AI and remote sensing to better monitor different managements in sustainable agriculture.

Margaux Alfare
Researcher, New York University

I am a researcher in the Environmental Studies Department at NYU, specializing in climate and land-use data analysis. My work involves using advanced programming languages and software (such as MATLAB and Python) to analyze multi-dimensional geospatial datasets, conduct statistical analyses, and create visualizations for scientific publications.

I'm also the Data Manager for iN-Net, a 4-year NSF-funded initiative focused on advancing policy-relevant research to support ambitious national efforts to address nitrogen pollution. In this role, I am developing a publicly accessible data dashboard that makes nitrogen-related data more accessible and usable to help policymakers, researchers and civil society at large build national action plans to halve nitrogen waste.

Andy Bell
Director, UNESCO Biosphere
NICCEE Global Advisory Board

Hicham Benslim
Research Assistant, McGill University

I am Research Assistant candidate working on nitrogen dynamics in agricultural systems, with a focus on nitrous oxide (N_2O) emissions and their environmental impacts. My research combines field experiments, laboratory analyses, and data analysis to better understand how soil, climate, and management practices influence nitrogen transformations. I am particularly interested in identifying strategies to improve nitrogen use efficiency and reduce greenhouse gas emissions in agriculture.

Shabtai Bittman
Research Scientist, Agriculture and Agri-Food Canada
NICCEE Global Advisory Board

Research Scientist, nutrient cycling, farming systems, Canadian Ammonia Emission Inventory

Henry Bourret
Masters Researcher, University of Guelph

I am a graduate researcher at the University of Guelph. I am very passionate about research involving soil science and nutrient management within the agricultural sector. I completed my undergraduate degree at the University of Guelph in environmental science with a co-op. Through this co-op, I gained experience working in analytical labs and completing field agricultural work. This led me to my master's project under the Wagner Riddle Lab at the University of Guelph. My research utilizes large weighing soil lysimeters to quantify the effects of enhanced efficiency fertilizers for increasing nitrogen use efficiency and reducing the amount of nitrogen leached out of the soil profile toward groundwater reservoirs. The fertilizer losses are quantified using a 15N isotopic tracer. My goal is to complete the graduate program, then continue to develop skills to grow my career in the agricultural industry.

Jessica Bowes
Office of the Vice-President, Research and Innovation, University of Guelph

With an entrepreneurial outlook and a genuine passion for supporting ground-breaking ideas, Jessica has more than 18 years' experience in commercialization and knowledge mobilization positions in the food and agri-technology sector. She is currently Assistant Vice-President Research, Innovation & Knowledge Mobilization at the University of Guelph, with responsibility for innovation broadly across campus. She

works closely with the greater community to grow and maintain strategic research alliances with private- and public-sector partners looking to innovate, enhance knowledge translation, foster social impact, and convert ideas and research into commercial opportunities. Her prior experience includes over a decade with Bioenterprise Corporation, a national agri-tech accelerator and innovation network, most recently in the role of VP, Commercialization. As a key member of Bioenterprise's executive leadership team, Jessica led client services and adapted operations to support the evolving ag-based ecosystem. She has more than 10 years of experience in commercialization advisory services, creation and maintenance of strategic and collaborative stakeholder relationships, and impact reporting. Previously, Jessica has held positions focused on development and delivery of knowledge mobilization strategies, communications, and training of Highly Qualified Personnel through positions at the Schlegel-University of Waterloo Research Institute for Aging (Agri-food for Healthy Aging consortium) and MaRS Landing.

Jessica holds a MSc in Human Health and Nutritional Sciences and a BSc in Biological Sciences, both from the University of Guelph. She is certified in Knowledge Translation and Transfer through a research-oriented program delivered by the University of Toronto and SickKids.

Thomas Bruulsema
Chief Scientist, 4RPN Consulting

An experienced scientist with a passion for nutrient stewardship in agriculture, I have worked with industry, environmental, and scientific groups to lead agricultural service providers in advancing sustainability. Recent achievements include contributions to nutrient stewardship certification programs in Ohio, Michigan, Indiana and Ontario, and to international initiatives in sustainable management of nitrogen and phosphorus.

Jun Suk Byun
PhD candidate, University of Maryland Center for Environmental Science

Jun Suk Byun is a PhD student at University of Maryland Center for Environmental Science. His research is focused on nitrogen management in the agrifood system and how it impacts water quality. Jun Suk has a background in animal science and experience working with cattle.

Laura Cardenas
Principal Research Scientist, Rothamsted Research

Laura has a PhD in Atmospheric Chemistry from UEA (1997) for which she developed her own analyser to measure atmospheric concentrations of formaldehyde. She deployed this instrument at remote field sites and on board a Hercules C-130; she has also measured DMS emissions from the ocean on board a research vessel. In 1999, she began to develop an automated state-of-the-art laboratory system to explore the controls of nitrous oxide (N2O) and nitrogen gas (N2) cycling in soils and has studied factors controlling emissions. Laura is studying the role of the nitrogen pools in gaseous emissions; the link between grazing behaviour and N2O emissions from extensive upland and intensive lowland systems; and testing mitigation strategies. She is a key contributor to the Defra inventory of greenhouse gas emissions, responsible for the compilation and submission to the UNFCCC of the UK agricultural GHG inventory.

Anne-Marie Chapman
Director Research, Development and Technology, Agriculture and Agri-Food Canada

Anne-Marie is the Director of Research, Development and Technology for Agriculture and AgriFood Canada's StHyacinthe and Guelph Research and Development Centres, and Director of the national Air and Climate Research Portfolio. She sets research priorities, coordinates national scientific activities, and forges strategic partnerships that advance the Government of Canada's science and climate objectives. As such, she represents the Government of Canada on the Efficient Fertilizer Consortium, providing federal leadership to international efforts on fertilizer innovation and nutrient management. Her work plays a key role in shaping Canada's research agenda on climate-smart agriculture.

Before joining AAFC, Anne-Marie spent 15 years at Environment and Climate Change Canada, where she designed and implemented policies to reduce environmental impacts from the energy sector. She led the development of the Government of Canada Fuel Life Cycle Assessment Model, which is now widely used by industry and government, including for carbon credit generation under the Clean Fuel Regulations. Her policy expertise is rooted in her early career as an agricultural engineering consultant, where she worked directly with producers and private sector partners. This blend of practical field

experience and federal policy leadership continues to guide her work at the intersection of science, regulation, and innovation.

EDUCATION
Bachelor in engineering – rural engineering, Université Laval
Master`s in Agri-Food Engineering, Université Laval
Master`s in Arts, Philosophy, Université St-Paul

Adrian Collins
Science Director, Rothamsted Research
NICCEE UK Lead

Adie's research interests broadly encompass the sustainability and resilience of agriculture. They specifically include a number of themes: 1) characterising pollutant emissions to water and air; 2) the development and application of pollutant source tracing procedures; 3) understanding cross-sector water pollution at different scales and the development of screening tools for contextualising the role of agriculture in water quality problems; 4) the impacts of agricultural pollution on aquatic ecology; 5) measuring and modelling the efficacy of on-farm interventions for managing agricultural sustainability and resilience, and; 6) scenario-based evaluation of technically feasible mitigation impacts on multiple outcomes for policy support. His expertise includes hydro-chemical monitoring at multiple scales, integrating empirical and modelling approaches for scaling up, and pollutant source fingerprinting.

Kate Congreves
Professor, University of Saskatchewan

Dr. Kate Congreves is a Professor in the Department of Plant Sciences, the Jarislowsky & BMO Chair in Regenerative Agriculture, and a Sustainability Faculty Fellow at the University of Saskatchewan. She is an award-winning researcher and teacher, and the author of over 65 peer-reviewed publications. Congreves' research program is focused on understanding the soil biogeochemistry of nitrogen (N) flow, cycling, and loss in crop production systems. Her lab specializes in field-based agronomy for a diversity of crops, in using 15N stable isotopes techniques to trace N dynamics, and in measuring greenhouse gas emissions. Currently, she leads the GreTA (Greenhouse gas Towers for Agriculture) research station in Saskatchewan, contributing to the Canadian N2O Network and Global Nitrogen Centre. The long-term vision is widespread implementation of sustainable N management, and the creation of regenerative agroecosystems that produce healthy food without posing reactive-N threats to our environment.

Suprem Das
Associate Professor, Kansas State University

I lead one of the (proof-of-concept) NSF global centers called BioSense Innovations at Kansas State University, where the focus is to develop sensing technologies for soil nitrates and nitrous oxide greenhouse gas emission. Also, the center is studying fundamental BNI activities for greenhouse gas mitigation.

Eric Davidson
Professor Emeritus, University of Maryland Center for Environmental Science
NICCEE Executive Committee

Biogeochemistry of nitrogen, including N2O emissions, on local to global scales

Marieme Drame
Scientific Technician, Rothamsted Research

I am an early career researcher, I hold a PhD in Environment and Agrifood. My PhD research focused on measuring greenhouse gas and ammonia emissions from enhanced efficiency fertilisers (e.g., urease inhibitors) and determining fertiliser nitrogen use efficiency. My recent work also involved investigating seaweed derived biostimulant on crop growth and stress tolerance.

Alison Eagle
Senior Scientist, Agriculture, Environmental Defense Fund
NICCEE Global Advisory Board

Dr. Alison Eagle provides science leadership for EDF's agriculture team in issues of field-crop nutrient management, soil carbon and other aspects of agricultural greenhouse gas mitigation and climate resilience. Her research translates agronomic, soil science and economic data to help decision makers access sound scientific evidence. Recent publications address realistic expectations for soil carbon sequestration, research data standardization, and metrics for quantifying environmental outcomes from nitrogen management interventions. Before joining EDF in 2017, Dr. Eagle worked as a research scientist at Duke University. She holds a PhD from Wageningen University (2009), a MS from the University of California–Davis (2000) and a BSc from the University of Alberta (1997).

Zineb El Gorai
PhD student, Mohammed VI Polytechnic University (UM6P)

I am a PhD student at Mohammed VI Polytechnic University (UM6P), working on carbon sequestration in argan trees using advanced remote sensing techniques. My research aims to quantify in order to monetize carbon credits derived from these ecosystems.

In addition, I am an engineer and lecturer at the Department of Informatics and Statistics at the Institute of Agronomy and Veterinary Medicine Hassan II. I teach courses in machine learning, deep learning, and statistics, focusing on both theoretical foundations and practical applications

Noha El-Ghobashy
Co-CEO, The Institute for Transformative Technologies

Noha S. El-Ghobashy is a mechanical engineer, inventor, founder, and venture builder, recognized for her leadership in engineering and innovation. She is Co-CEO of the Institute for Transformative Technologies (ITT), where she leads initiatives to develop breakthrough technologies and launch enterprises that expand access to energy, health, sanitation, and food systems in low- and middle-income countries. Earlier in her career, Noha was Executive Director of the ASME Foundation, where she led a philanthropic portfolio focused on STEM education and engineering for global development. She also founded Engineering for Change, a global platform that has reached more than one million practitioners and mobilized a network of engineers, entrepreneurs, and development professionals across 100+ countries. She began her career in engineering roles, contributing to patented innovations in telecommunications systems. She holds B.S. and M.S. degrees in Mechanical Engineering from Columbia University and has served as an Adjunct Professor at the Polytechnic Institute of NYU. Noha currently chairs the External Advisory Board of Columbia University's Mechanical Engineering Department. In 2013, she received the American Association of Engineering Societies' Kenneth Andrew Roe Award and was named one of the New York Business Journal's Women of Influence. Born in Egypt, Noha now calls New York home.

Colin Elgie
Soil Fertility Specialist - Field Crops, Ontario Ministry of Food, Agriculture, and Agribusiness

Colin has been the Soil Fertility Specialist for Field Crops since joining OMAFA in 2022. His major focus has been updating nutrient recommendations for field crops, through collaboration with partners at the University of Guelph and on farm. Prior to joining OMAFA, Colin was head agronomist at an ag retailer in southwestern Ontario, and led the company to have the first 4R certified retail location in Ontario. Colin graduated from the University of Guelph with a B.Sc.(Agr.) degree in 2009. Colin currently farms cash crops and processing vegetables outside of Dresden, Ontario with his brother, father, and uncle."

Andrew Elmore
Vice President for Research and Economic Development, University of Maryland Center for Environmental Science

Andrew Elmore works broadly across issues relevant to global environmental change, with a particular focus on landscape ecology, biogeochemical cycling in watersheds, and the management of land and water. He applies an array of tools to these problems, including remote sensing data analysis and Geographical Information Science (GIS). Dr. Elmore received a BSc in Applied Physics from Purdue University and an MSc and PhD in Geoscience from Brown University. He is Professor and Vice President for Research and Economic Development at the University of Maryland Center for Environmental Science.

Daphnee Ferland
PhD Candidate, University of Saskatchewan

I am PhD candidate focusing on micrometeorology, greenhouse gases and sustainable cropping systems in Western Canada.

Anikka Fife
Graduate Research Assistant, University of Maryland Center for Environmental Science

Second year Masters student and GRA for UMCES HPL

Nadine Frost
VP Industrial Affairs, Fertilizer Canada

As Vice-President of Industrial Relations at Fertilizer Canada, Nadine Frost works to consolidate and address regulatory issues and shape government policy relevant to the fertilizer industry. Within this role, Nadine provides leadership on environmental policy and regulatory development, focusing on the upstream fertilizer manufacturing and production sector. Additionally, Nadine works across industry members and government to advance the fertilizer sector's safety and security programs, and supply chain issues.

Following her BSc. (Honours) in Toxicology from the University of Guelph, Nadine completed her MSc. in Chemistry from Carleton University (2015). Her research was focused on the use of synthetic DNA aptamers as recognition elements in biosensors to detect harmful agricultural mycotoxins in the field. Since joining Fertilizer Canada in 2015, Nadine has obtained her Environmental Professional (EP) designation through ECO Canada.

Yujing Gao
Assistant research scientist, University of Maryland Center for Environmental Science

Climate change and adaptations; Agroecosystem modeling

Michelle Gareau
Master student, University of Guelph

I am an MSc candidate in Environmental Science at the University of Guelph. My research focuses on agricultural soil–atmosphere interactions, specifically how nitrogen fertilizer management regulates N_2O emissions and fertilizer specific losses. I am committed to developing sustainable land management strategies that mitigate greenhouse gas emissions while maintaining agricultural productivity and long-term soil health.

Sarah Garvey
NICCEE Program Manager
Assistant Research Scientist, University of Maryland Center for Environmental Science

Sarah Garvey (she/her) is the Program Manager for the Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE). NICCEE leverages use-inspired and data-driven approaches to understand the impacts of green ammonia on climate change and the environment, as well as to support sustainable nitrogen management.

Sarah is an interdisciplinary scientist interested in biogeochemistry, climate science, and coupled human-natural systems. Sarah received her B.A. from the University of Pennsylvania and earned her Ph.D. with the Hutyra Terrestrial Carbon Lab at Boston University. Her previous research combined lab, field and analytical work to investigate the effects of urbanization and forest fragmentation on soils and the carbon cycle. Prior to her graduate work, she studied rangeland soil carbon storage with the MacArthur Agro-Ecology Research Center at Archbold Biological Station.

Pearce Gourley
Sustainbility Associate Manager, PepsiCo

Lead Canadian Regen Ag work for PepsiCo

Yafei Guo
Postdoctoral Research Scientist, Rothamsted Research

I am a Postdoctoral Research Scientist at Rothamsted Research in the United Kingdom, working at the North Wyke research platform. My research focuses on sustainable agriculture, particularly how nitrogen fertilisers influence greenhouse gas emissions, soil health, and crop productivity. I study the movement and transformation of nitrogen in soil–plant systems, with the aim of improving nitrogen use efficiency while reducing environmental impacts such as nitrous oxide and ammonia emissions.

My work combines field experiments, laboratory analysis, and data analysis to evaluate different fertiliser management strategies, including enhanced-efficiency fertilisers and nitrification inhibitors. I am also involved in international and interdisciplinary collaborations related to climate change mitigation, clean energy, and sustainable food production. My broader interests include soil biogeochemistry, carbon–nitrogen cycling, greenhouse gas monitoring, and developing practical solutions that support both agricultural productivity and environmental sustainability.

Thomas Hamann
Professor, Michigan State University
NICCEE Green Ammonia Technology Advisory Committee

Inorganic Chemistry Professor; research on ammonia storage, renewable energy & catalysis.

Lora Harris
Professor, University of Maryland Center for Environmental Science
NICCEE Executive Committee

A trained oceanographer, working at the land margins, committed to science-informed decision making and support to communities facing environmental challenges

Frances Houle
NICCEE Green Ammonia Technology Advisory Committee

Bilal Javed
Postdoctoral Researcher, McGill University

I am a postdoctoral researcher in Geography at McGill University working at the intersection of agriculture, environment, and sustainability. My research focuses on nitrogen management in cropping systems, especially how fertilizer practices vary across regions and how these patterns relate to nitrogen use efficiency and broader environmental outcomes. I work with farm survey data, geospatial analysis, and crop information to better understand where and how different nutrient management strategies are being used. More broadly, I am interested in building practical evidence that can support more sustainable agricultural systems, improve nutrient stewardship, and connect farm-level management with regional and policy-scale questions.

Smriti Kala
Senior Scientist, International Fertilizer Development Center

Smriti Kala holds PhD. in Chemistry and over 17 years of expertise in formulation chemistry research. She previously served as a Scientist (Formulation) at the, Government of India, where she led and contributed to the development, optimization, and scale-up of advanced agrochemical formulations. She worked extensively on agrochemicals delivery systems, product stability, and enhancing efficacy, leading to sustainable formulation technologies. Currently, she serves as Senior Scientist – Formulation at the International Fertilizer Development Center (IFDC), Muscle Shoals. Her work focuses on green ammonia formulation and its integration into sustainable fertilizer systems for Sub-Saharan Africa. She is actively involved in developing efficient formulations technologies for improving soil health, enhancing crop productivity, and reducing environmental impact. With deep expertise in fertilizer chemistry, formulation science, and product development, she brings a strong blend of laboratory innovation for realistic agricultural application.

David Kanter
Professor, New York University
NICCEE Executive Committee

NICCEE co-PI, NYU prof of Environmental Studies and chair of the International Nitrogen Initiative

Taehoon Kim
PhD student, McGill University

I am a Ph.D. student at McGill University, working on nitrogen flow accounting within Canadian agri-food systems, with a focus on improving nitrogen use efficiency and transitioning toward more sustainable agricultural practices.

Dilrukshi Kombala Liyanage
Graduate Student, University of Guelph

I'm a Ph.D. candidate in Environmental science at the University of Guelph working under Dr. Claudia Wagner-Riddle. I'm investigating cover crop mixtures, evaluating complementarity in root soil interactions and effects on greenhouse gas emissions. I'm aiming to understand how the use of cover crop mixtures could optimize the greenhouse gas reduction benefit through increased diversity and complementary root-soil interactions of different species. My long-term educational goal is to contribute to research on greenhouse gas emissions reduction.

Kristin Küyük
Program Director, U.S. National Science Foundation

Kristin Küyük serves as Program Director in the Office of International Science & Engineering (OISE) at the U.S. National Science Foundation (NSF) where she assists with implementation of bilateral and multilateral cooperative partnerships and lead agency opportunities to promote international collaborative research and build joint programs. Kristin serves as the lead covering NSF's portfolio of international collaboration with the United Kingdom and Ireland. Kristin also serves as managing program director for OISE's International Research Experiences for Students (IRES) program and as part of the program management team supporting NSF's Global Centers program. Kristin has over two decades of Federal government service. Prior to joining OISE, Kristin served in NSF's Division of Behavioral and Cognitive Sciences and earlier in her career she worked for the U.S. Fish & Wildlife Service. Her research interests involved integrated conservation of cultural and natural resources, particularly connections between endangered wildlife and local resource-dependent cultures and the valuation of Indigenous knowledge within science.

Page Kyle
Earth scientist, Joint Global Change Research Institute (JGCRI), Pacific Northwest National Laboratory

Hai Lan
Assistant Professor, University of South Alabama

I have a diverse professional background in big geospatial data analytics, GeoAI, parallel and distributed geocomputation, and spatiotemporal modeling. My research spans the interdisciplinary fields of GIScience, environmental science, and computational science. Currently I'm mainly focusing on using AI-enabled models with scalable big geospatial data analytics and spatiotemporal modeling to study the global nitrogen cycle and its environmental consequences across the ocean, atmosphere, and land, as well as the potential implications for public health.

Luis Lassaletta
Associate Professor, Universidad Politécnica de Madrid
NICCEE Global Advisory Board

Expert in nitrogen cycling and management across scales, from plot-level processes to the global level, including cropping systems, livestock, and agro-food systems. INI-Europe Director

David Layzell
Emeritus Professor, The Transition Accelerator & University of Calgary
NICCEE Green Ammonia Technology Advisory Committee

My PhD was in Plant Physiology, then I was a Professor specializing in the use of gas exchange technologies to study biological Nitrogen Fixation as well as the flows of energy and materials in plants. In the early to mid 2000s, my research focus shifted to the study of energy systems in Canada, and the required changes in the flows of energy and material to address climate change.

Sophie LeClaire
Graduate Student, University of North Carolina at Chapel Hill

I am a PhD candidate at UNC Chapel Hill that works on bacterial competition within Vibrio squid. While I may not work directly with green ammonia I have experience in science communication and policy that I am applying to green ammonia work for NICCEE.

Peter Lehner
Managing Attorney, Earthjustice

environmental lawyer

Tongzhe Li
Professor, University of Guelph

I combine economic theory and behavioral approaches, such as field or laboratory experiments, to understand the economic and political context of a problem. My current projects focus on agri-environmental issues, public goods contribution, innovation adoption, consumer behavior, and food policy.

Zitong Li
Graduate Research Assistant, University of Illinois Urbana-Champaign

I am a Ph.D. student at the University of Illinois Urbana-Champaign. My research focuses on agricultural nitrogen emissions, especially ammonia (NH_3), and their impacts on ecosystems and air quality. I use satellite data to observe atmospheric ammonia at large scales and link these patterns to activities such as fertilizer use and livestock production. My work combines remote sensing and data analysis to better understand how human activities influence the environment.

Dong Liang
Associate Research Professor, University of Maryland Center for Environmental Science

My background is in the integration of Bayesian statistical methods with spatiotemporal empirical modeling and ecological and environmental monitoring. In NICCEE, I applied these techniques to conduct deep dive of the nitrogen flow at regional scales, both conventional and novel big data streams (remote sensing) were integrated in this process. The goal is to develop spatial assessment of nitrogen flow, while quantifying the uncertainty arising from misalignments in the data scales, and reporting methods. The research will be conducted following the open-data principle to enable co-development of the nitrogen assessment within and without the center, data will be shared in a custom built geoportal.

Emily Lischynski
Masters Student, University of Saskatchewan

I graduated from the University of Saskatchewan in 2025 with a Bachelor of Science in Agriculture, majoring in crop science and minoring in applied plant ecology. My past work experience includes working in both the private and public sector, conducting research involving commercial canola breeding, brassica root morphology analysis, and pulse pathology. I am currently pursuing my Masters in plant science, analyzing the nitrogen recovery efficiency of cropping systems across Canada under diverse nitrogen management strategies.

Cassandra Loomans
Vice President, Sylvite

As Vice President of Sylvite, Cassandra Loomans is responsible for executing the company's long-term strategic plan in partnership with the executive leadership team. She oversees organizational operations, driving sales performance, operational excellence, employee development, and a collaborative culture that supports sustainable growth.

Since joining Sylvite in 2007, Cassandra has held progressively senior leadership roles across multiple business units, including Sylvite Sales, Sylvite Agri-Services, and Sylvite Industrial Chemicals. Her experience spans strategic planning, customer service, sales, operations, and fertilizer procurement, an area of expertise she is particularly passionate about and has championed throughout her career.

Cassandra holds a Bachelor of Commerce degree from the University of Guelph and is a graduate of the Agri-Food Management Excellence Executive Development Program.

She serves on the Boards of Directors of Fertilizer Canada, The Fertilizer Institute, and Responsible Distribution Canada, and is Past President of the Ontario Agri Business Association. She also previously served as a board member of Halton Food for Thought.

Through her leadership and industry involvement, Cassandra contributes to the continued growth of Sylvite and the advancement of Canada's agricultural sector.

Elided Lumor

Graduate Student, University of Guelph

I am Elided Junior Lumor, a passionate soil biogeochemist from Ghana, West Africa. My current research focuses on nitrogen carbon and water biogeochemical cycles in agroecosystems, specifically how different agricultural management or land use affect nitrogen and carbon speciation in soil, plant and atmosphere. My major interest is in using the eddy covariance tower and flux gradient technique to quantify net ecosystem carbon balance, evapotranspiration and nitrous oxide emissions. I intend to answer how different future climatic scenarios (i.e., climate, intense freeze and thaw, drought, etc.) or management activities (i.e., cover crop, crop rotation, nitrogen inhibitors) affect nitrogen, carbon and water balance and what are the possible yield responses.

Graham MacDonald

Associate Professor, McGill University

The emphasis of my work is on regional- to global-scale dimensions of agricultural land use and management. I have a particular focus on nutrient management (nitrogen and phosphorus) in agriculture. My research also addresses themes of food systems (spanning food production, distribution, and consumption aspects). As a geographer, I work with different methods, but particularly enjoy spatial modelling.

William Makaza

PhD Candidate, Mohammed VI Polytechnic University (UM6P)

William Makaza is a soil scientist and plant nutrition specialist with a Ph.D. from Mohammed VI Polytechnic University (UM6P), Morocco. His research focuses on sustainable fertilizer and soil amendment management for smallholder cropping systems, with interests spanning soil acidity, lime quality, fertilizer-use efficiency, and safe application at crop establishment. He has led research and development initiatives across sub-Saharan Africa, Morocco, and Canada. He is a NICCEE alum, a 2024 African Plant Nutrition Scholar, and has authored two book chapters and over fourteen peer-reviewed articles.

Mikhail Maslov

Research Associate, University of Manitoba

Dr. Mikhail Maslov, P. Ag. is a Research Associate specializing in sustainable agricultural practices in the Canadian Prairies. His research evaluates the combined effects of tillage intensity, cover crop integration, and 4R nitrogen management on corn agronomic performance with a focus on mitigating N_2O and CO_2 emissions. His work contributes to the development of region-specific best management practices that enhance nitrogen use efficiency, promote soil health, and mitigate agriculture's environmental footprint under Prairie climate conditions. Additionally, Dr. Maslov is coordinating the multi-year collaborative project 'Effect of 4R Nitrogen Management on N_2O Emissions from Field Crops in Manitoba' with four Manitoba Diversification Centres and Applied Soil Ecology lab.

Josh McBee

Josh McBee is a climate and energy policy strategist based in Austin, Texas. He spent nearly seven years at Climate Advisers, a Washington, DC-based policy consultancy, working on international climate strategy, with a particular focus on food systems and non-CO_2 greenhouse gases, particularly methane and nitrous oxide. His nitrogen-related work has included developing international advocacy strategies to elevate nitrous oxide mitigation within global climate negotiations, coordinating with government and civil society partners across multiple countries, and co-leading an effort within the International Nitrogen Network's governance working group focused on responsible use of green ammonia as an alternative shipping fuel and fertilizer. He holds a PhD in philosophy from Johns Hopkins University.

Jordan Minigan
Research Program Coordinator, University of Guelph

Ibrahim Mohammed
Sustainability and Environment Specialist, Grain Farmers of Ontario

I am a Sustainability & Environment Specialist at Grain Farmers of Ontario, where I work within the Market Development team. My role focuses on sustainability initiatives, environmental performance, and the integration of science-based approaches to support Ontario grain farmers. I regularly collaborate with internal teams, academic partners, and industry stakeholders on projects related to life cycle analysis, carbon intensity modeling, regenerative agriculture, and sustainability communications.

Raghuram Nandula
Professor, Guru Gobind Singh Indraprastha University

Prof. N. Raghuram is the founder-Head of the Centre for Sustainable Nitrogen and Nutrient Management the School of Biotechnology, Guru Gobind Singh Indraprastha University, New Delhi, and Adjunct Professor of plant science at the University of Hyderabad. He specialises in plant G-protein signalling and crop nitrogen and phosphorus use efficiency, apart from their environmental and policy aspects. Awarded as the best teacher and outstanding researcher, his 203 publications include 69 journal articles, 16 books, 38 book chapters 24 microarrays/sequences, and 56 other articles with >4275 citations globally. He co-led the first Indian, South Asian and International Nitrogen Assessments. He chaired the International Nitrogen Initiative (2019-2022) and was a Steering Committee member of the UNEP Global Partnership for Nutrient Management (2009-2024). He co-organized 3 International Nitrogen Conferences, including as Chair of N2024. He facilitated the first ever India-led UNEP resolution on Sustainable Nitrogen Management (2019). He is currently President of the Sustainable India Trust and the Society for Conservation of Nature. He is also the Editor-in-Chief of the Springer journal, Physiology and Molecular Biology of Plants. He taught over 20 courses for B.Tech/M.Tech/M.Sc. and mentored 101 theses (11 Ph.D, 21 M.Tech., 2 M.Sc., 73 B.Tech.) in 3 universities. He held national and international projects worth over Rs. 100 million and has been a consultant to Unilever, UN agencies and World Bank.

Nidhi Nidhi
Research Assistant, University of Guelph

Since graduating from my undergraduate degree in Environmental Economics and Policy, I have been working professionally as a Research Assistant at the Food, Agricultural, and Resource Economics Lab at the University of Guelph. Within the lab, my work involves coordinating field and laboratory experiments, managing data collection, supporting participant engagement, and assisting with research design and data analysis. In addition to research, I am passionate about community engagement and youth-centered sustainability initiatives, including organizing collaborative events that connect community, innovation, and social impact.

Samuel Njoroge
Scientist, African Plant Nutrition Institute

I am a scientist at the African Plant Nutrition Institute (APNI), based in Nairobi, Kenya, where I work with the East and Southern Africa Program. I hold a PhD in Plant Production Systems from Wageningen University in the Netherlands and have over 15 years of experience working with smallholder farming systems across Africa.

At APNI, I lead the Core Competence Area on Site-Specific Fertilizer and Agronomy, an initiative focused on developing practical, farmer-centered nutrient management solutions that support sustainable crop productivity intensification across Africa's diverse agroecosystems. My work brings together field research, decision-support tools, and adaptive experimentation to translate agronomic science into actionable recommendations for farmers, extension systems, and policy partners.

Over the years, I have been closely involved in designing and implementing on-farm research on 4R Nutrient Stewardship, site-specific nutrient management, and yield response analysis, helping strengthen evidence-based approaches to improving soil fertility and crop performance in smallholder systems. I am particularly motivated by efforts that connect rigorous science with real-world farming decisions to support resilient, profitable, environmentally sustainable, and productive agricultural landscapes across the continent.

Simon North
Agronomy Lead, Fertilizer Canada

Agustin Olivo
Postdoctoral Researcher, University of Guelph

Agustin Olivo is a postdoctoral scholar in the Wagner-Riddle lab, and his work focuses on analyzing the impact of beneficial agricultural management practices on greenhouse gas emissions from crop fields, primarily simulating carbon and nitrous oxide fluxes using the DeNitification-DeComposition (DNDC) model. Also, studying the impact of whole-farm alternative management strategies for mitigating greenhouse gas emissions from Canadian dairy systems. Agustin holds a bachelor's degree from the National University of Córdoba, Argentina, a master's degree from the University of Nebraska-Lincoln, USA, and PhD from Cornell University, USA.

Rachel Opitz
Program Manager, Taylor Geospatial

Rachel Opitz is Taylor Geospatial's program manager for sustainable agriculture and food security initiatives. Her work connects researchers driving innovation in geospatial technologies with teams addressing challenges across food and agricultural systems. Prior to joining Taylor Geospatial, Rachel spent 20 years as a researcher investigating long-term human-environment interactions and their effects on soil-plant-water systems today through remote sensing and geophysical prospection.

Kiran Pavuluri
Director of Innovations & Research, International Fertilizer Development Center

I am a research and innovation leader in sustainable agriculture with over 20 years of experience across academia, industry, and international development.
My work focuses on developing and evaluating new fertilizer technologies and farming practices that increase crop productivity while reducing environmental impacts such as nutrient losses and greenhouse gas emissions. I have managed large, multi-country research programs, collaborated with public and private partners, and secured significant research funding.

Currently, I serve as Director of Innovations and Research at the International Fertilizer Development Center, where I lead multidisciplinary teams to design and deliver research that improves how nutrients are used in agricultural systems. Previously, I led product development initiatives at Yara and Sirius Minerals, contributing to the creation and global testing of new agricultural inputs. My research background includes a Ph.D. from Virginia Tech and experience in data analysis, field experimentation, and modeling to support sustainable agriculture.

Bahman Pourtaherian
PhD Candidate, University of Guelph

I am a PhD candidate in School of Environmental Science In University of Guelph. I have a bachelor in Economics and Master in Agricultural and resources economics. My research is focused on farmers adoption behavior toward beneficial management practices (such as soil tests, fertilizer metering systems, and nitrogen stabilizers) using experimental economics.

Mathieu Proulx
PhD Student, University of Manitoba

I am a Ph.D. student in soil science at the University of Manitoba, focusing on nitrogen management in grain corn, with an emphasis on improving the adoption and economic performance of split nitrogen applications in the Northern Plains. I hold a master's degree from the University of Manitoba and a degree in agronomy from Université Laval, and I have over a decade of experience in agricultural research, farm management, and on-farm decision-making.

I also serve as the lead agronomist and field operator at R & L Acres Inc. in Manitoba, where I am involved in integrating technologies such as spray drones and supporting the development of Canada's first on-farm green ammonia pilot project, led by FuelPositive. My background includes on-farm field trials, fertilizer R&D, and sustainable farm management.

N. Raghuram
Head, Centre for Sustainable Nitrogen and Nutrient Management School of Biotechnology
Professor, GGS Indraprastha University

Keerthika Nirmani Ranathuinga
Postdoctoral Researcher, University of Guelph

My project focuses on scaling up large datasets related to soil processes and greenhouse gas (GHG) emissions using outputs from the DNDC model. Working within a multidisciplinary team, my research aims to investigate potential modeling approaches for understanding nitrous oxide (N_2O) emissions and emission factors associated with synthetic fertilizer application, and to compare model-derived estimates with those reported in Canada's National Inventory Report. As part of the NICCEE modeling team, I use biogeochemical models and ensemble modeling approaches to improve understanding of the mechanisms driving GHG emissions from agroecosystems and to support the scaling up of mitigation practices.

Hammed Opeyemi Rasaq
PhD Student, Mohammed VI Polytechnic University (UM6P)

Hammed is a PhD Student at the Mohammed VI Polytechnic University (UM6P) in Morocco. His research focuses on water and nutrient management in the olive cultivation systems, as well as climate risk assessment, with the aim of advancing climate change mitigation and adaptation strategies. He holds an MSc in Climate Change at the Pan African University, Institute for Water and Energy Sciences in Algeria and a BSc in Meteorology and Climate Science from the Federal University of Technology, Akure, Nigeria. Prior to his current role, Hammed worked as a Research Assistant with the United Nations University (UNU-VIE) in Bonn on the RETO-DOSSO project in Niger Republic.

Muhammad Riaz
Professor in Environmental Science, Government College University Faisalabad

I work as Professor of Environmental Science at Government College University Faisalabad, Pakistan. I earned PhD in Environmental Science from University of York, UK in 2011, and, have received postdoctoral trainings at University of Adelaide Australia, WSL/ETH/UZH Switzerland and Radboud University Nijmegen Netherlands. My research interests broadly include soil biogeochemistry of CNP cycling, soil quality and health indicators, and nutrient and water use efficiencies in agriculture. I have been actively involved in activities of INMS, FAO-LEAP and iN-NET which aim to reduce the N footprints of human activities. I am partner of European Commission Horizon Europe "LEGUMINOSE" Project that explores and promotes cereal-legume intercropping for sustainable crop production and improved N cycling.

Valentina Roel
Postdoctoral Associate, New York University

Valentina Roel is concluding her Ph.D. in Plant Sciences at the University of California, Davis, specializing in agronomy, soil health, and nitrogen management. In September she will be starting as a Postdoctoral Associate at NYU with David Kanter. Her research integrates crop productivity, environmental impacts, and economic outcomes to evaluate sustainable nutrient management strategies. She has lead field-based experiments assessing organic amendments, nitrogen use efficiency, and greenhouse gas emissions in California agroecosystems, combining field measurements with life cycle analysis approaches.

Valentina's work emphasizes trade-offs between yield, nitrogen losses, and ecosystem services, with a focus on informing policy-relevant metrics such as social costs of nitrogen and carbon footprints of cropping systems.

Navdeep Saini
PhD Student, University of Guelph

I am a PhD candidate in Environmental Sciences at the University of Guelph. My doctoral research focuses on reducing methane emissions from stored liquid swine manure using acidification strategies, with an emphasis on microbial communities, methanogenic activity, and greenhouse gas mitigation under different storage temperatures.

Alongside my PhD, I am currently completing an internship on microbial strategies for biological nitrogen fixation.

William San Martin
Assistant Professor; Worcester Polytechnic Institute, Department of Global Studies; Chair Governance Working Group, International Nitrogen Network

William San Martín is an Assistant Professor of Global Environmental Science, Technology, and Governance at Worcester Polytechnic Institute. His research advances approaches to nitrogen governance, emphasizing interdisciplinary and community-engaged strategies to address challenges across the Global North and South. He chairs the Governance Working Group of the International Nitrogen Network (iN-Net) and co-leads two NSF-funded international projects on sustainable nitrogen management. Originally from Chile, he earned his Ph.D. at the University of California, Davis, and completed postdoctoral fellowships at MIT and the Rachel Carson Center for Environment & Society. He's currently an Affiliated Scholar with Brown University's Climate Social Science Network, a Research Associate at the African Anthropocenes Research Centre at Stellenbosch University, and a Research Fellow with the Earth System Governance Project at Uppsala University.

Tek Bahadur Sapkota
Principal Scientist, International Maize and Wheat Improvement Center (CIMMYT)

Tek Studies N dynamics in cropping system and its consequences to climate change adaptation and mitigation

Hanxiong Song
Postdoctoral Researcher, McGill University

I have research experience in developing and applying process-based model and machine-learning models to understand the responses of C and N cycles to climate and management changes

Mario Tenuta
Professor, University of Manitoba
NICCEE Green Ammonia Technology Advisory Committee

Baby Keerthi Thirunagari
Postdoctoral Researcher, University of Maryland Center for Environmental Science

I completed my PhD at the Indian Institute of Technology Delhi, where I modeled the impact of agricultural practices on air quality. Building on this, I am now a Postdoctoral Researcher at the UMCES Appalachian Laboratory, working on Nitrogen 2.0, a project that traces nitrogen sources, movements, and environmental effects. My research links agriculture, atmospheric chemistry, and ecosystem science to better understand and manage nitrogen's impact on both human and environmental health. I am eager to collaborate across disciplines to develop strategies for sustainable nitrogen management.

Edin Thornton
Policy Fellows Manager & Operations Manager (Contractor), New York University - International Nitrogen Network (iN-Net) and International Nitrogen Initiative (INI)

Edin Thornton is an operations and policy specialist working at the intersection of environmental science, governance, and international collaboration, with a focus on nitrogen sustainability and systems-based environmental solutions. Through her work with the International Nitrogen Network (iN-Net), an NSF AccelNet-supported initiative, she supports coordination across scientific, policy, and stakeholder communities.

Her expertise includes science policy communications, stakeholder engagement, strategic coordination, and translating complex scientific concepts into accessible, policy-relevant language. Edin brings both operational leadership and systems thinking to the nitrogen space, with experience supporting international workshops, governance discussions, collaborative research initiatives, and network development. Her work emphasizes actionable, equitable approaches to sustainability grounded in relationship-building and cross-sector collaboration.

Laura Van Eerd
Professor, University of Guelph

Dr. Laura Van Eerd is the Charlotte Products Chair in Net Zero Soil Management and Professor in the School of Environmental Sciences at the University of Guelph. The goal of her internationally-recognized research program is to advance understanding of how agricultural practices influence soil health and biogeochemical cycling of carbon and nitrogen. She aims to find solutions for farmers that enhance soil care, crop productivity, and profit margins. Her innovation and foresight led to the establishment of a state-of-the-art long-term experiment that has advanced global knowledge on cover cropping in temperate climates. In addition to awards acknowledging her significant contributions to teaching, research and extension, Dr. Van Eerd is a Fellow of the Canadian Society of Agronomy, a Soil Champion (Ontario Soil and Crop Improvement Association 2021) and an Influential Women of Canadian Agriculture (2020).

Vanessa Vargas-Nguyen
Science Integrator, University of Maryland Center for Environmental Science

Kim Chi Vi
PhD student, University of Guelph

Chi is a PhD candidate in Environmental Science and International Development Studies at the University of Guelph, under the supervision of Dr. Claudia Wagner-Riddle. Her doctoral research focuses on directly measuring greenhouse gas emissions from feed crop production at a Living Lab hub farm, while also exploring participants' experiences and the innovation processes within the living lab approach. Her research interests include agricultural greenhouse gas measurement and the role of farmers and communities in climate solution initiatives.

Srishti Vishwakarma
Postdoctoral Researcher, Oak Ridge National Laboratory

Srishti Vishwakarma is currently a Postdoctoral RA at the Computational Sciences and Engineering Division at Oak Ridge National Laboratory. Previously, she worked at Joint Global Change Research Institute (JGCRI) within the Pacific Northwest National Laboratory (PNNL). Her research interests stem around challenges associated with developing and implementation of advanced data science methods for modeling global socio-environmental processes and addressing the interdisciplinary problems of global food security, sustainability, and extreme weather stress impacts. Since 2023, she has been serving as a Review editor for Data-Driven Climate Sciences Section within Frontiers in Big Data. Moreover, she has been a core team member of the AI Working Group of the MultiSector Dynamics (MSD) and the Cropland Nutrient Balance of FAOSTAT.

Claudia Wagner-Riddle
Professor, University of Guelph
NICCEE-Canada Lead

Claudia grew up in Brazil and developed an interest in soil and climate after a frost destroyed many of the coffee plantations in her region. The plantations were replaced with annual crops such as soybeans and corn, and that brought with it a lot of soil erosion. Her first summer job as a student working with a researcher on no-till and cover crops furthered her interest in soil and ways of managing it. The experience also sparked an interest in agriculture. After completing her bachelor's degree, she took a research position in Germany looking at soil erosion, which inspired her to eventually pursue graduate research. Today, she is a world-renowned environmental science researcher focusing on the mitigation of greenhouse gases emitted by agricultural production systems.

Yuhao Wang
Postdoctoral Researcher, University of Maryland Center for Environmental Science

Yuhao is a first year Postdoc working with Xin Zhang at UMCES. His current work at NICCEE is working on a spatial global nitrogen budget map

Yanyu Wang
PhD Student (graduated in May), University of Maryland Center for Environmental Science

Ray Weil
Professor, University of Maryland

Ray Weil is Professor of Soil Science at the University of Maryland and an international leader in sustainable agricultural systems in both developed and developing countries. Weil's research focuses on organic matter management and cover crops to enhance soil health, nitrogen conservation, and nutrient cycling for water quality and sustainability. In addition, he has authored recent editions of The Nature and Properties of Soils, the most widely used textbook in soil science, with over 30,000 citations. His lab developed analytical methods for determining soil microbial biomass and active soil carbon (POXC) that have been adopted by the USDA/NRCS and are used in soil health and ecosystem studies worldwide. His research, pioneering the use of forage radish and multi-species cover crops, has influenced cover-cropping practices across North America. His contributions to improved cropping systems and soil management have been put into practice on farms large and small.

Weizhe Weng
Assistant Professor, University of Guelph

I am an assistant professor in the Department of Food, Agricultural and Resource Economics at the University of Guelph. I am an environmental and natural resource economist with a particular interest in utilizing economic and interdisciplinary frameworks to quantify the interactions between agricultural production and environmental outcomes, evaluate the outcomes and effectiveness of agri-environmental policies, and provide a foundation for science-based policymaking.

Pengxin (Pansy) Wu
PhD student, University of Illinois Urbana - Champaign

I am a first-year PhD student in the Department of Natural Resources and Environmental Sciences at the University of Illinois Urbana–Champaign. Before starting my PhD, I earned a BS in Geographical Sciences from Beijing Normal University.

My research focuses on improving nitrogen use efficiency in maize production systems in the U.S. Midwest through more precise nitrogen management. I integrate large datasets from on-farm field trials with process-based ecosystem models to study how maize yield responds to nitrogen under different environmental conditions and management practices. My work aims to better understand how factors such as weather, soil properties, and crop management practices influence crop productivity and nitrogen losses, with the broader goal of supporting more environmentally and economically sustainable agriculture.

Yusheng Zhang
Postdoctoral Researcher, Rothamsted Research

With a strong interest in the sustainability of agricultural systems, I have worked on multiple pollutants—including sediment, phosphorus, and nitrogen—across scales ranging from fields and farms to catchments and national assessments. I am particularly keen to use integrated modelling approaches to address policy-relevant questions, especially those concerning the mitigation of unintended consequences arising from intensive farming practices.

Xin Zhang
Professor, University of Maryland Center for Environmental Science
NICCEE Director and US Lead

I am an environmental scientist using data-driven and transdisciplinary approaches to tackle emerging sustainability challenges. The goal of Xin’s current research is to evaluate how socioeconomic and biogeochemical processes affect the global nutrient cycle and the sustainability of agricultural production and, in turn, provide policy input on mitigating nutrient pollution while meeting global food and biofuel demands.

Contact Us

Xin Zhang

NICCEE Director
Professor
University of Maryland Center for Environmental Science, Appalachian Laboratory
xin.zhang@umces.edu

Sarah Garvey

NICCEE Program Manager
Assistant Research Scientist
University of Maryland Center for Environmental Science, Appalachian Laboratory
sarah.garvey@umces.edu

Claudia Wagner-Riddle

NICCEE Canada-lead
Professor
University of Guelph
cwagnerr@uoguelph.ca

Adie Collins

NICCEE UK-Lead
Science Director
Rothamsted Research
adrian.collins@rothamsted.ac.uk

Visit us online at niccee.org.

Have comments or questions about NICCEE and the Nitrogen Summer Institute? Click here or scan the QR code.

Appendix A: NICCEE Principles of Conduct

The Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE) is committed to providing **a safe and brave space for individuals, groups and communities to collaborate, innovate, and respond to the challenges and opportunities of green ammonia**. NICCEE does not tolerate discrimination, harassment, or intimidation of any person or group on any basis, including race, ethnicity, religion, age, sex, sexual orientation, gender identity or expression, disability, national origin, citizenship status, socioeconomic background, position or title, political affiliation, caretaker status, or other characteristics. All members of the NICCEE community should expect to be held to the following code of conduct:

1. **Treat all members of the NICCEE community with respect, fairness, and courtesy at all times**. Actively cultivate a work environment that is respectful, supportive, friendly, and free from harassment and intimidation. The NICCEE community comprises people first and foremost. Physical and mental health, safety, and well-being are always top priorities.
    a. Respect differing opinions, perspectives, and identities.
    b. Respect the privacy and confidentiality of colleagues and their work.
    c. Respect intellectual property rights and give credit where it is due.
2. **Foster a culture of inclusivity and collaboration across disciplines, backgrounds and identities**. Recognize the value and unique contributions of everyone within the NICCEE community.
    a. Be mindful to avoid talking down to others based on their expertise. Discourage disciplinary pride that may hinder interdisciplinary collaboration.
3. **Critique output, not individuals**. Give constructive feedback with kindness and respect, and receive constructive feedback with an open mind.
4. **Practice open science and communication**. Share data sets, methodologies, computer code, and data visualizations openly and transparently. Thoroughly document research processes and results for reproducibility. Publish data sets and your findings whenever possible.
    a. **To foster trust and respect in the NICCEE community**, maintain the confidentiality of sensitive information, including personal disclosures and proprietary research data. Respect the intellectual property rights of others. Being open to sharing information that could benefit the research community is encouraged.
    b. **Communicate openly and honestly** within NICCEE, with outside colleagues and collaborators, and with the public.
5. **Strive to be interdisciplinary. Communicate complex ideas and jargon in language that is clear and understandable**.
6. **Respect one another's cultural identities and life experiences**. Recognize that cultural diversity enriches our understanding and approach to innovation in green ammonia.

NICCEE is committed to providing a working and learning environment free from sexual harassment through training, education, prevention programs, and policies and procedures that promote prompt reporting, prohibit retaliation, and promote timely, fair, and impartial investigation and resolution in a manner that eliminates the sexual harassment, prevents its recurrence, and addresses its effects. All members of the NICCEE community, as well as third parties and subcontractors, are subject to this policy. All NICCEE program participants will be expected to complete the UMCES training on "Sexual Harassment Prevention", or equivalent training in their home institution.

Incident Reporting

NICCEE will follow Title IX guidelines to recommend reporting of any harassment or discrimination, including instances of bullying, in a trauma-informed context that also provides additional support. The UMCES Title IX Coordinator is Lisa Ross, Assistant Vice President of Human Resources (titleix@umces.edu or lross@umces.edu).

Subcontractors will be required to demonstrate that they have established policies and procedures that comply with Title IX and that their program members are provided with contact information for the subcontractor's Title IX coordinator, or equivalent. UMCES requires that any agreement with a subcontractor acknowledges that the parties will promptly share any reports of harassment or discrimination occurring in off-campus settings and that they agree to cooperate in any investigation involving their participants.

When disagreements arise, NICCEE recommends:

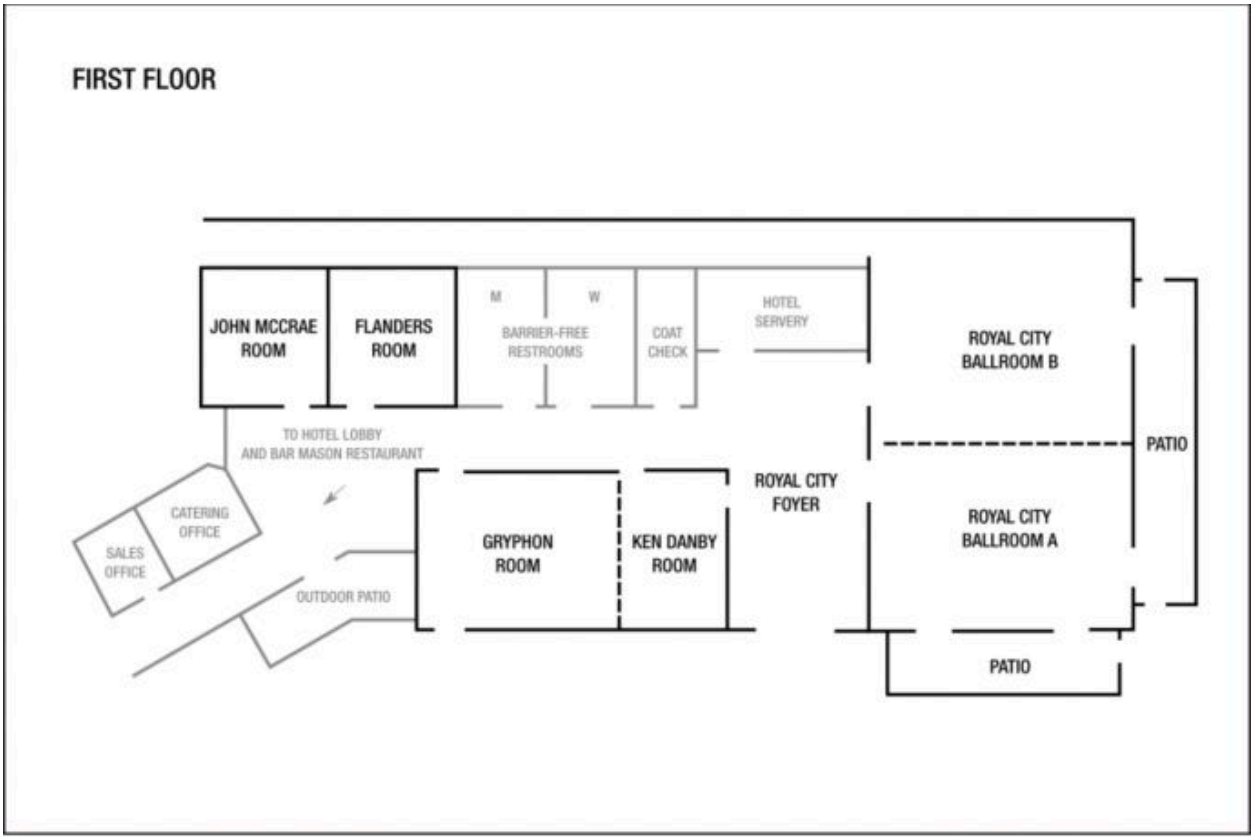
1. Whenever possible, engage in honest and civil dialogue between parties involved as a first step toward resolving disputes.
2. If needed, individuals may seek support from the UMCES Title IX Office

Resources

UMCES Code of Conduct
UMCES Policy on Sexual Harassment
UMCES Policy on Professional Conduct & Workplace Bullying
UMCES Policy on Non-Discrimination & Equal Opportunity

University of Guelph Human Rights Policy
University of Guelph Sexual Violence Policy

NSF Office of Equity and Civil Rights
NSF Office of Inspector General Hotline
NSF Awardee Civil Rights Compliance Program

** The NICCEE Code of Conduct is adapted from the UMCES code of conduct and UMCES policies on Sexual Misconduct, Professional Conduct & Workplace Bullying, and Non-Discrimination & Equal Opportunity.*

Appendix B: Delta Hotels Guelph Conference Centre Floor Plan