

GLOBAL RESEARCH ALLIANCE

ON AGRICULTURAL GREENHOUSE GASES

GRA FLAGSHIP PROJECT TITLE: Development of context-specific emissions factors from the application of nitrogenous fertilisers

Co-leads

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Overview of project

- **Start date and project length:**

- March 2022
- 48 months, however need to add another year to match pillar grants funding (to end March 2027)

- **Brief description of project:**

- *Synthetic fertiliser, nitrous oxide, ammonia, emissions factors, GHG inventory, mitigation*
- Significant N₂O emissions result from the application of nitrogenous fertilisers through direct N₂O emissions (EF₁) and indirect N₂O via ammonia volatilization (FracGASF) and N leaching (FracLEACH-(H)).
- However, there is a dearth of information on the environmental and soil conditions and relevant variables including farm systems and management practices (timing, amount, rate and location of fertiliser application) that underpin estimates of these emissions, and there are large gaps in some regions and productive systems.

Goal

- To compile existing data and undertake new field measurements to develop **context-specific emissions factors** relating to the application of **synthetic N fertilisers** for the purpose of inventory improvement including **N₂O mitigation accounting**.

Key Participants and Resources

■ Current participants and resources:

Countries/institutions/organisations involved in discussions to date include

- Chile (INIA)
- Argentina (INTA)
- Costa Rica (INTA; Univ. of Costa Rica)
- Peru (La Molina Univ.)
- Brazil (Embrapa)
- New Zealand (AgResearch; Landcare Research; Lincoln Univ.)
- Australia (Queensland Univ. of Technology)
- Ireland (Teagasc)
- UK (Rothamsted Research; Bangor Univ.)
- Switzerland (ETH Zurich)
- Denmark (Aarhus Univ.)
- Norway (Univ. of Oslo)
- Spain (Univ. Politechnic Madrid)
- Germany (Thuenen Institute; Univ. of Goettingen; Univ. of Hohenheim)
- Canada (AAFC)
- USA (USDA; Colorado State Univ.)
- China (CAAS)
- IITA – CGIAR
- CIMMYT – CGIAR
- International Fertiliser Association

Project phases

Phase I

Data collation
Yr 1-4
(months 1-40)

- Modify DATAMAN database
- ID key factors for data collation
- Database collation and release

Phase II

Field Research
Yr 2-3
(months 13-36)

- Complete ongoing field research
- Conduct new studies based on data gap analysis
- New grants/funding

Phase III

Data modelling
Yr 2-4
(months 13-40)

- Dataset gap filling
- Statistical modelling
- Process-based modelling (ensemble of models)
- Context-specific EFs and mitigation recommended

Expected outputs

Phase I

Expanded
database

Scientific
manuscripts

Public release
of database

Phase II

Protocol and
guidelines

Scientific
manuscripts

New research
grants

Phase III

New
mitigation
options

Tier 2 & 3

Scientific
manuscripts

Activities to date

1. REfining Emission Factors for Inventory Reporting (REEFIR) [IRE-NZ agricultural GHG joint call].

4-year proposal, led by Tony van der Weerden (AgResearch) and Dominika Krol (Teagasc).

→ AIM: develop Tier 2/3 N₂O emission factors for various N sources including synthetic N fertiliser.

- Builds on the DATAMAN project
- Focus on temperate grassland systems
- Collating emissions data from synthetic N fertilizer sources, including mitigation technologies
- Conducting new experimental work quantifying emissions from N sources in Ireland and NZ
- Synthetic N fertiliser database analyzed using both statistical and process-based modeling approaches.
- €1.49M

2. Optimizando el uso de nitrógeno, mayor producción y menor impacto (N4R) (FONTAGRO).

4-year proposal, led by Sara Hube (INIA)

→ AIM: develop Tier 2/3 N₂O emission factors for various N sources including synthetic N fertiliser.

- Focus on temperate and tropical cropping and grassland systems
- Conducting new experimental work quantifying emissions from synthetic N fertilizer sources and testing mitigation technologies
- This grants will carry out experimental sites in Argentina, Perú, Dominican Republic, Panama and Chile. US\$400.000

Launch meeting



2 March 2023
Johnstown Castle,
Wexford, Ireland
(Teagasc)

- In-person/virtual meeting
- Participants from 10 countries
- Overview of Flagship, REEFIR (NZ-IRL project) and N4R (South American project) provided
- Identified ways to work together:
 - Provision of data and potential joint publications
 - Collaborative process-based modelling
 - Knowledge sharing to aid capacity building
- Draft template for collating field data circulated for comment to participants

Opportunities for involvement

1. Contributing historical and future measurements of N₂O and ammonia from diverse production systems and fertiliser treatments, with associated site information (database analysis e.g. DATAMAN initiative)
2. Contributing expertise in statistical analysis, modelling
3. New funding collaborative initiatives