FAIRagro Use Case

UC2 – Assessing tradeoffs for optimal crop nitrogen management

Dr. Aida Gonzalez-Mellado

Thünen Institut

Prof. Dr. Heidi Webber

Leibniz Centre for Agricultural Landscape Research

FAIRagro Community Workshop – 14. Oktober 2022

Photo: Petair | AdobeStock

FAIRagro

- Nitrogen (N) losses are severe environmental problem though N often limits crop yields
    - Improving N management challenging
    - interplay of crop N uptake and soil N
    - transformations
    - soil heterogeneity
    - weather uncertainty

- Research question: How can crop rotations and N fertilization be designed to optimize tradeoffs between crop yield and N losses?

- Hypothesis: improved data availability & infrastructure for integrated soil & crop model parameterization, applications & scaling can improve N tradeoff assessments
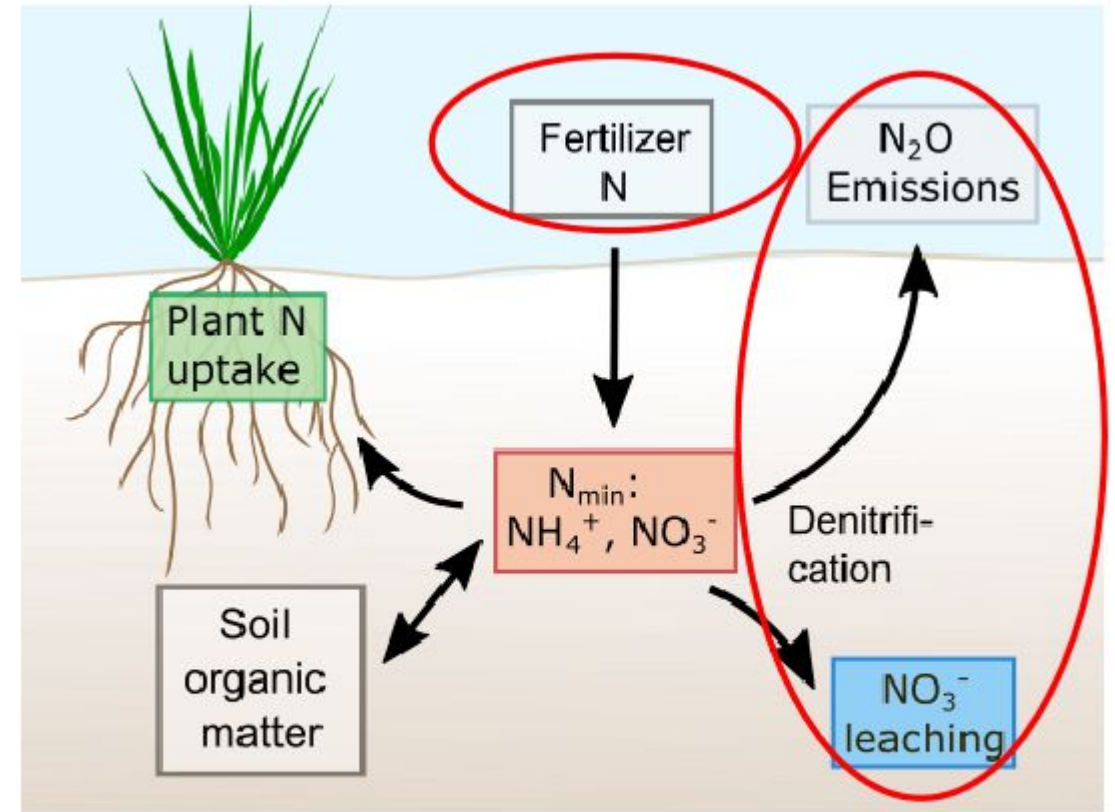
(Figure from Maire Holz, 2021)

FAIRagro

- **Soil scientists**

- **Crop scientists**

- **Agronomists**

- **Agroecosystems**

- **Agricultural economists**

- Hydrologists (water quality)

- Biodiversity

- **Sub-field (process knowledge)**

- **Field & farm (management decisions)**

- **Landscape (environmental problems)**

- Market (influences management decisions)

- National (regulations)

- Global (climate system)

FAIRagro

1. Improve data access and standardization to various existing geo-referenced datasets

2. Improve access to legacy data for model parametrization through digitalization, standardization, making findable and geo-referencing of experimental datasets on soil and crop nitrogen processes

3. Support more transparent and reproducible data scaling and aggregation of both model input and simulation data with aim to reduce and better quantify uncertainties

Value added from the Use Case

1. **Searchable data base for common model input data**
    → weather, soil, crop phenology and management

2. **System to create standardized model datasets from legacy experimental studies**
    → use existing data extraction methods

3. **Platform for data aggregation of model input and simulation data**
    → collate and standardize existing landuse & production area datasets needed for aggregation
    → allow user specification of target resolution and aggregation methods
    → provision data at desired resolution with documentation
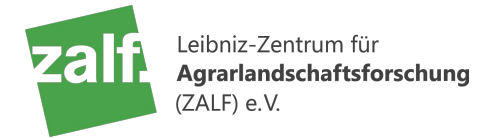   → offer uncertainty quantification

Envisaged Outcomes

FAIRagro

1. **Develop a processing pipeline to create model calibration datasets, extending current** *Bonares Knowledge Library*
   a. Improving metadata recording options
   b. Linking to geo-spatially relevant data in FAIRagro Portal
   c. Piloting of digitalization function for extracting and exporting publication results

2. **Create framework for data scaling and aggregation** (linked to the FAIRAgro Portal)

Use Case Duration: 2024–2026

UC Partner

zalf. Leibniz-Zentrum für **Agrarlandschaftsforschung** (ZALF) e.V.

HELMHOLTZ ZENTRUM FÜR UMWELTFORSCHUNG UFZ

THÜNEN

Deutscher Wetterdienst **Wetter und Klima aus einer Hand** DWD