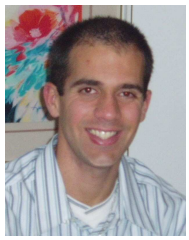
Towards Improvement of N Models To Meet the Environmental Diagnosis Requirements



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BACKGROUND & OBJECTIVES

Water and atmosphere contamination by nitrogen in cropped soils are constantly evocated. Models are important tools to evaluate and predict contamination risks, but which of them:

(1) Can be adaptable to a large range of soil and climate contexts and over crop successions?
(2) Is easy to parameterize by environmental stakeholders and agricultural advisers?

The objectives were to find out whether models exist that satisfactorily simulate N losses in agro-ecosystems, allow easy input of data and can integrate agronomic and environmental changes, and if not, what was missing?

METHODOLOGY

A review of the literature was carried out on models dealing with N behaviour in the soil-plant-atmosphere system. A total of **62 models** and more than **180 publications** were analyzed in order to identify:

(1) the **processes simulated** and the time and space scales,
(2) the **equations** used for each process,
(3) the **inputs data** and their facility of accessibility,
(4) their **performance** to simulate field measurements, using statistical criteria.

RESULTS & DISCUSSION

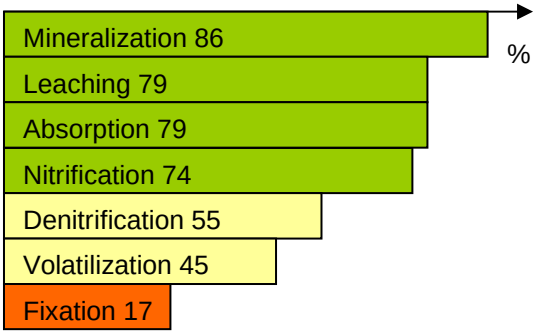

Figure 1: fraction of models calculating N processes (%)

-Gaseous losses less taken into account by models

-Spatial scale mainly the plot (83%), then farm (7%) and watershed (10%)

-A quite large choice of concepts and equations to model N behaviour

-High contrast in equations used for absorption and nitrification with high variability of input data

-Massive use of correction factors, notably for recent models

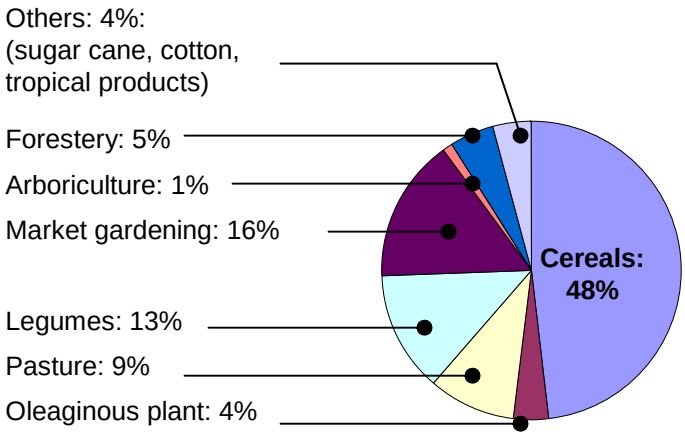

Figure 2: crop species simulated by models

-Five models with more than 45 published papers each, based on their use: Ceres, Century, Epic, Apsim and SoilN

-Overall good performance for simulating mineralization and nitrification (RMSE < 30%)

-Little publications for volatilization performance simulation and the worst performance for denitrification

-Lack in crop diversity integrated in models

CONCLUSIONS

- Mechanistic models shown **high simulation capacity** on various soil and climate conditions, and crop successions.

-The most recent models are **more functional** and empirical, **easy** to parameterize, using elements of mechanistic models, but adapted to **specific contexts**.

- Potential users have to be associated with scientists in the conception of environmental diagnostic tools, to propose a model adaptable to a large range pedoclimate contexts and at the pluri-annual modelling scale. This is the objective of the **Azosystem project**

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