



Contacts

Gianni Bellocchi

gianni.bellocchi@inrae.fr

Sébastien Fontaine

sebastien.fontaine@inrae.fr

Keywords

Sustainable agroecosystems

Microbial and plant biodiversity

Multi-species covers

Fluxes and synchronisation

Modelling

Thematics involved

Ecology

Agronomy

Applied mathematics

Departments involved

ACT

AgroEcoSystem

AQUA

EcoSocio

Units involved

UREP

UMR SADAPT

UMR EMMAH

UR P3F

Partners

CREA Research Centre for

Agriculture and Environment, Italy

CREA Research Centre for Animal

Production and Aquaculture, Italy

LIEC - CNRS

VetAgroSup Campus Agronomique

de Clermont-Ferrand

Modelling the relationship between microbial and plant diversity in multi-species agroecosystems

Backgrounds and challenges

Interactions between plant diversity and soil microbiological diversity play a crucial role in regulating carbon and nutrient cycles within agroecosystems. Microbial diversity significantly affects processes like nitrification, denitrification and carbon sequestration. In parallel, diversification of plant species can enhance microbial utilisation of carbon and nitrogen by synchronizing nutrient supply and demand. The MODIMIV project is dedicated to the development of simulators that model these intricate interactions within multi-species grassland systems. By utilising permanent grasslands as a study system, MODIMIV seeks to introduce innovative solutions for agricultural systems, aligning with Biosefair's sustainability objectives.



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Objectives

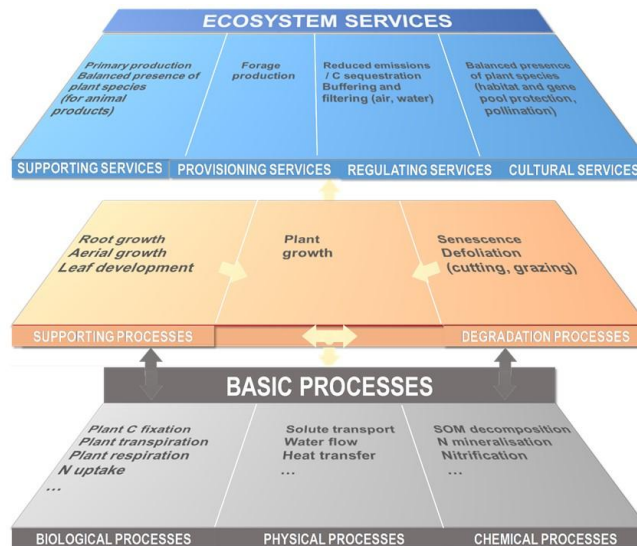
The objectives of the MODIMIV project are as follows:

- Exploring interactions between plant and microbial diversity: The project investigates the role of biological diversity in regulating carbon and nutrient cycles in permanent grasslands to gain a better understanding of the complex dynamics within these ecosystems.
- Developing dynamic simulators: These tools incorporate plant and microbial diversity into grassland ecosystems to enhance the modelling of ecological processes associated with grassland cover and pave the way for a better understanding of the underlying mechanisms.
- Assessing the implications of biological interactions for ecosystem services: The project examines how plant and microbial diversity influence the regulation of nutrient cycles and carbon sequestration, highlighting the significance of these mechanisms for ecosystem sustainability.
- Providing long-term prediction models: This is a major objective, as these models contribute to supporting sustainable practices by providing information for agricultural management.
- Promoting innovation in agriculture: MODIMIV encourages the emergence of innovative approaches to address sustainability challenges in agricultural systems, aligning with Biosefair's priorities for shaping the future of agricultural practices.

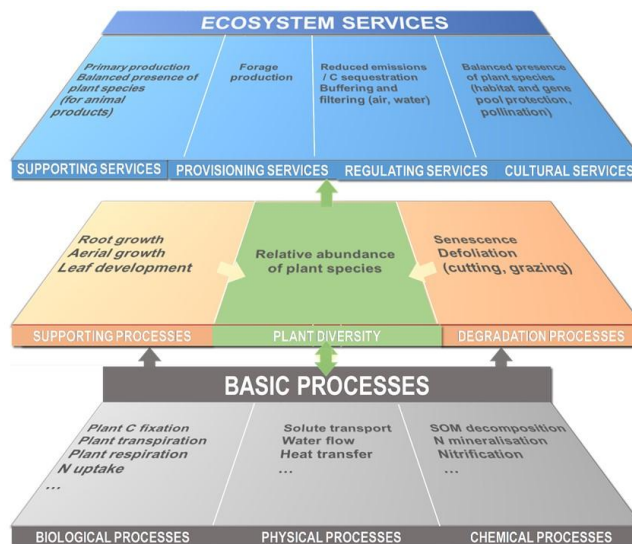
Approaches

MODIMIV positions itself as an in-depth study of the interactions between microbial and plant diversity in multi-species agroecosystems, aiming to shape a sustainable and innovative agroecological transition. The project is built upon regular collaboration within the consortium, with semi-annual workshops to facilitate the exchange of ideas. Four master's level M2 internship programmes play a crucial role in deepening knowledge and experimental analysis. Two experimental internships allow students to immerse themselves directly in experiments, contributing to data analysis from an isotopic labeling platform and plot devices for subsequent modelling. In parallel, two modelling internships are of vital importance in translating experimental data into modeling, enhancing the understanding of interactions between plant and microbial diversity. MODIMIV is committed to writing modelling articles based on internship reports while organising workshops and presentations at scientific events. Simultaneously, through the drafting of a position paper, the project aspires to define a roadmap for the development of these models, highlighting the use of new technologies to support modeling work.

Conventional approach, no explicit integration of biological biodiversity



Introduction of plant biodiversity dynamics



MODIMIV approach, integrating the complex interactions between plant and microbial diversity

