Building Transferable Agent-Based Models for Water Management Scenarios in rice crops systems in South East Asia

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CONTEXT

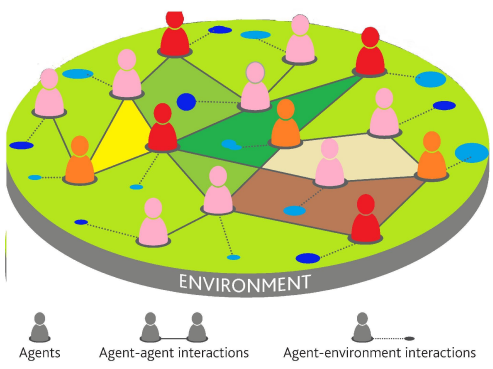
- Alternate Wetting and Drying (AWD) offers significant potential to reduce methane emissions from irrigated rice, but its implementation in collective irrigation systems depends on complex interactions between water dynamics, farmers' decisions and institutional arrangements.
- Agent-Based Models (ABMs) can represent these socio-ecological interactions, yet their development and calibration remain too time-consuming for operational and participatory decision-making.
- Existing socio-economic, institutional and agricultural datasets provide a strong foundation for developing transferable ABMs, while identifying the minimum hydrological and local information required for rapid, parsimonious calibration.

How can a modular ABM framework enable rapid deployment of reliable, locally adapted models for participatory evaluation of water management scenarios?

SCIENTIFIC OBJECTIVES

- Develop a modular Agent-Based Modelling framework separating generic and site-specific components of irrigated rice systems with focus on water management scenarios.
- Define a parsimonious calibration strategy by identifying the minimum local data and parameters required.
- Demonstrate the feasibility of rapid deployment through a prototype implementation on one irrigation scheme

THE MISSION



- Review existing Agent-Based Models (ABMs) for irrigated agriculture and rice systems, analyzing how they represent farmer behavior, water allocation, infrastructure and collective decision-making.
- Analyze available datasets from Cambodia and Vietnam to identify key biophysical, institutional and social processes, common patterns, site-specific characteristics and calibration variables.
- Develop a modular ABM framework integrating water flows, AWD implementation, crop processes, farmer decisions and collective irrigation management, while separating generic and adaptable components.
- Implement and document a prototype model on one irrigation scheme, defining calibration strategies and recommendations for future deployment across other irrigation systems.

REQUIRED PROFIL

- A student combining quantitative modelling skills with an interest in agricultural, water and social systems, including interactions between people, institutions and the environment.
- Ability or willingness to translate field observations and existing datasets into conceptual and computational models to explore irrigation and socio-environmental dynamics.

THE RESEARCH UNIT: G-EAU

- G-EAU is an interdisciplinary research unit located in the North of Montpellier at the Agropolis campus
- It unites both social and natural scientists interested in the study of water - from hydrogeologists and remote sensing experts to human geographers and sociohydrologists
- Students will be able to integrate themselves into a rich and welcoming environment of scientific diversity. Weekly events include the Friday discovery seminar series (Vendredi Découverte), and the communal coffee social every Tuesday.