

## **Open call for post-doctoral candidates**

### **The INRA is offering a 24-month postdoctoral contract to deliver a thesis on modeling grassland ecosystems, based in Grignon, France**

#### **Research topic: Management options for increasing soil carbon in grasslands: measuring and modeling soil organic matter turnover and carbon stabilization in pasture soils**

The proposed research will be carried out as part of an international project led by the National Institute for Agricultural Research (France) and the Landcare Research Institute (New Zealand).

The intensification of pastoral farming is spreading around the world and its effects on soil properties are largely unknown, notably in terms of soil carbon dynamics. The limited evidence available suggests specific management practices may both production and carbon storage, but just how stable is this carbon we store? Our research focuses on the following questions:

1. Is accumulated C moving into stable soil pools, or is newly added C susceptible to loss as a result of changes in climate or new land management practices?
2. Would these new management practices alter the nature and turnover times of existing soil organic matter?

The algorithms developed to answers such questions will be imbedded into a dynamic system model (CenW) to improve our ability to predict net C balances and the stability of stored C in managed grasslands, in order to:

1. Quantify and compare the effects of diverse sward and high-input pastures on the stabilization of pasture-fixed C and its vulnerability to loss under environmental change;
2. Quantify and compare the effects of diverse swards, high-input pastures and cut and carry versus grazing on soil organic matter turnover, as mediated by soil moisture and temperature,
3. Develop and validate CenW, to improve our ability to model the effects of alternative intensification of soil C cycling, storage and mitigation scenarios.

We will test the model performance of CenW using long-term experimental datasets, examining how efficiently the model simulates different ecosystem processes, including CO<sub>2</sub> flux, plant growth, soil water balance, soil organic matter decomposition/SOM turn over, net ecosystem C balance, as well as SOC stock under pasture. We will also aim to determine precisely how the model may capture inter-annual variation and seasonal variation in different ecosystem processes. Evaluating the model using sensitivity analyses, we will identify the sensitive parameters with the greatest influence/control over plant growth, soil water and soil organic matter decomposition. A subsequent uncertainty analysis will also be carried out, in order to

measure the total uncertainty incorporated in model simulation output variables through these sensitive parameters.

This will strengthen our confidence and transparency in applying the CenW model to different future management and climatic scenarios. In the project's final stages, we aim to use the modified model to assess the impacts of feasible management change scenarios under typical and relevant conditions. The management scenarios under scrutiny will include differences in grazing/cutting intensity, the rooting patterns of pasture species and soil cultivation in relations to the application of fertilizers or irrigation. These simulations will be done under current and potential future climates and atmospheric CO<sub>2</sub> concentrations.

**Duties:** The post-doctorate position will mainly focus on modeling exercises, collecting data from long-term experiments, running models and analyzing modeling results. They will be expected to prepare manuscripts to submit to peer-reviewed journals.

**Qualifications:**

- A PhD in agricultural, ecosystem, bio-geoscience, or environmental science, or in related fields of science;
- A proven track-record in agro-ecosystems studies, field-based research and modeling;
- A demonstrated ability to conduct and complete research projects, generating and publishing their findings in international peer-reviewed journals;
- Strong written and oral communication skills in English.

**Skills:**

- A keen understanding of the complex biological problems in agroecosystems,
- Knowledge of carbon, nitrogen, heat and water dynamics in agroecosystems,
- Strong skills in ecosystem modeling and software development,
- Expertise in scientific computing, including proficient programming skills,
- Expertise in model evaluation, calibration, parameter optimization, sensitivity and uncertainty analyses, model improvement and scenario analyses,
- Strong statistical analysis skills

**Salary:** The net salary will be based on professional experience and skillsets.

**Application:** Please email your application to [abad.chabbi@inra.fr](mailto:abad.chabbi@inra.fr) with **Post-docGrassland** in your title, no later than **July 1, 2017**.

Applications should include a cover letter highlighting current research, activities and skills relevant to the position; an updated resume; an extensive publication list as well as 2 or 3 of your choice publications; the names and contact information of at least two professional references familiar with your qualifications and skills; the copy of your degrees and transcripts of your academic record. All documents are to be submitted in English – or French, if applicable.