

## Post-doctoral Position

<b>Title</b>	<b>What are the indirect effects of a large-scale reduction in the use of nitrogen fertilizers in Europe?</b> <i>Impacts will be studied through changes in biomass productions, surface water availability, net emissions of greenhouse gases, and nitrogen losses for the environment</i>
<i>Dead-line for Submission</i>	<b><u>June 30, 2018</u></b>
<i>Start of Contract</i>	~October 2018 (3 months delay are necessary between acceptance and start of the job = time requested for administrative procedures)
<i>Duration</i>	18 months
<i>Salary</i>	~1950 to 2800 € depending on the number of years of past experience
<i>Employer</i>	CEA
<i>Location</i>	Laboratoire des Sciences du Climat et de l'Environnement Orme des Merisiers 91191 Gif-sur-Yvette. France ( <a href="http://www.lsce.ipsl.fr/">http://www.lsce.ipsl.fr/</a> ; <a href="http://www6.inra.fr/basc">http://www6.inra.fr/basc</a> )
<i>Contact Person</i>	<a href="mailto:nathalie.de-noblet@lsce.ipsl.fr">nathalie.de-noblet@lsce.ipsl.fr</a> please send a complete CV + letter of motivation

## Description of the job

### *Scientific Context*

The land use sector plays a critical role in three major social issues: food security, the preservation of biodiversity and ecosystem services, and climate change mitigation through land-based carbon storage and management of other greenhouse gases emissions. A major challenge is to understand, measure and quantify the interactions and trade-offs between the production needed to meet demand for food, bioenergy production and the preservation of biodiversity and ecosystem services in the context of global change. Understanding these complex interactions is crucial to designing public policy that will avoid unwanted and unforeseen effects. Indeed, at the global level, biophysical, demographic and environmental drivers as well as public policies induce price changes that are major determinants of land use changes. Interrelated markets involve domino and leakage effects (e.g., incentives to use local rapeseed oil for energy in Europe may contribute to tropical deforestation through increased consumption of palm oil in the food industry). A paradox is that policies that have local environmental benefits (e.g., extensification of agricultural techniques) might have indirect effects on land use that reverberate across markets and countries through global price effects (i.e., "leakage").

The Laboratory of excellency (LabEx) BASC (Biodiversity, Agroecosystems, Society, Climate; <https://www6.inra.fr/basc>) has developed a range of economic and biophysical models to analyze the factors driving land use change and assess their ecological, agricultural, climatic and economic impacts. These models differ in their methodologies, scale of interest and resolution, but they are very complementary and could provide the LabEx with a unique capacity to analyze policies that influence land use.

In this context, BASC has put forward the STIMUL project (Scenarios Towards Integrating Multi-scale Land-use tools) that involves 1) the practical implementation of an interaction between these tools and 2) the use of these combined tools to investigate the effects of three integrated policy scenarios on changes in land use in Europe, and the

induced consequences in several dimensions (production, biodiversity, air and water pollution). The analysis of these scenarios will incorporate indirect effects, i.e. those caused by the changes in the global price vector, and the demand/supply responses. For some particular issues (e.g., biodiversity) a finer level of analysis (France) will be also developed as an exploration of downscaling analysis. Overall, STIMUL is a pilot project linking and increasing the consistency of existing tools, with the objective of further integration in the future. The methodological component (compatibility of variables, scales) and the data requirements are central to the project.

Among the various objectives of this project, one is to evaluate the consequences of a 50% reduction of nitrogen fertilizers in Europe on land uses and subsequent ecosystem services. The consequences of such public policy on land uses are now being produced and analyzed within two BASC laboratories (CIRED / <http://www.centre-cired.fr> and EcoPub / <https://www.ecopub.fr>).

The post-doc recruited will specifically have to **quantify how those induced changes in land uses further impact on some “ecosystem services” at the scale of Europe, under various scenarios of global climate change**. The ecosystem services will be computed by means of the ORCHIDEE-crop global vegetation model, developed at the IPSL in France. Changes in productivity, net emissions of CO<sub>2</sub> and N<sub>2</sub>O, water availability will be looked at.

### *Assignments*

The post-doc will work in close collaboration with scientists from various BASC's laboratories and will have three main tasks:

- Develop a tool to transform changes in land uses produced by the partial equilibrium models of land-use into land (cover and uses) maps to be read by ORCHIDEE-crop.
- Run ORCHIDEE-crop at the scale of Europe, forced with various land use and climate scenarios to produce sets of simulations that will allow analyzing the respective impacts of climate and land uses on some chosen simulated ecosystem services.
- Analyze those runs and more specifically develop useful diagnostics of impacts.

### **Requested Skills**

#### *Competences*

- Knowledge of biosphere-atmosphere interactions
- Experience with complex land surface / ecosystem models
- Statistical analysis
- Fortran and Python Programming

#### *Education*

PhD