

## PhD proposition in global agronomy

*A PhD project is proposed at Bordeaux Sciences Agro (Univ. Bordeaux) and INRAE on the following topic:*

### **Would organic farming expansion and reduced animal production be compatible? A global analysis based on nitrogen cycling, land-use changes and greenhouse gas emissions**

#### **Context**

Agricultural food production is responsible of roughly one quarter of global anthropogenic greenhouse gas (GHG) emissions. Curbing those emissions is key to achieve the Paris Agreement objectives. Organic farming has good potential to achieve low area emission intensity. However, due to its lower yields, concerns have raised that organic farming expansion may drive significant land-use changes and related CO<sub>2</sub> emissions.

In parallel, there is life cycle assessment-based evidence that food diets low in animal-sourced products help alleviate agricultural land requirements and GHG emissions. However, very few studies have considered the combination of both levers and simulated mechanistically their consequences for land-use change and related GHG emissions. In particular, the effect of reduced animal population on nitrogen (N) supply as manure – a critical resource for organic cropping systems – and its resulting consequences on organic food production has never been assessed thoroughly.

#### **Objectives**

This PhD aims at exploring to what extent organic farming expansion in Europe, combined with changes in food and feed consumption, may affect land use worldwide and related GHG emission. In particular, this PhD will deliver additional knowledge on the compatibility between a climate neutral organic farming objective and the current lobbying (whatever the reasons) for more vegetal-rich or exclusively plant-based diets.

The PhD project will be based upon the combination of two spatially-explicit models simulating respectively biomass, nitrogen and carbon flows within organic systems (GOANIM model), and agricultural products resource-utilisation balances, international trade and land-use changes (GlobAgri model). The PhD will combine both models to simulate a set of European-based scenarios including alternative assumptions on organic farming development (rate of expansion and type of farming), changes in feed rations (from current to low opportunity cost feed) and changes in food diets (from current to vegetarian and vegan diets).

#### **Expected profile**

- MSc student with sound bases in geosciences, agricultural sciences or in ecology with clear interest in environmental issues. Experience in mathematical modelling or scenario assessment is an asset
- Interest for large scale studies (country, planet)
- Excellent writing skills, fluent in English. If possible, some French notions. Being already author of scientific publications is an asset.
- On top of that, you are rigorous, autonomous, creative, reactive and motivated by working in a research environment

#### **Supervision and working conditions**

The PhD student will be co-supervised by Prof Thomas Nesme (Univ. Bordeaux) and Dr Chantal Le Mouél (INRAE, SMART-LERECO, Rennes). The PhD student will be enrolled within a small group located

in Bordeaux (four permanent scientists, three PhD students) working on nutrient cycling and modelling at large spatial scale (district, country, planet). The PhD student will also have strong interactions with the group located in Rennes (three permanent scientists) working on agricultural market and trade modelling. The PhD student will benefit from the collaborations that each supervisor has with other groups in France and abroad. A short stay of 3-4 months in a research group abroad will be organised.

The PhD student will be part of ISPA department (joint unit between INRAE and Univ. Bordeaux on Interactions between Soil, Plant and Atmosphere, <https://www6.bordeaux-aquitaine.inrae.fr/ispa>), located at INRAE campus, just 15 minutes cycling from Bordeaux downtown. The PhD student will graduate from Bordeaux Univ.

The PhD student will be part of an international, interdisciplinary project (CLimate Neutral Organic agriculture in Europe – CLINOrg) gathering skills in agronomy, animal science, forestry, soil science, economics, econometrics, geography, and nutritional epidemiology.

The PhD student will be offered a three years contract with INRAE, whose funding is entirely secured. The gross salary will be 1770€ per month (including social security for illness, maternity and unemployment, as well as financial help for public transportation and lunches). The PhD is expected to start on January 2022.

#### **How to apply?**

Any student interested in this proposal is invited to send his/her CV and a motivation letter to Thomas Nesme ([thomas.nesme@agro-bordeaux.fr](mailto:thomas.nesme@agro-bordeaux.fr)) and Chantal Le Mouël ([chantal.le-mouel@inrae.fr](mailto:chantal.le-mouel@inrae.fr)) **before November 15<sup>th</sup>, 2021**. The letter will illustrate how the candidate considers his/her skills and experiences match the PhD expectations.

The applications will be pre-selected by Prof Nesme and Dr Le Mouël. The pre-selected candidates will be invited to an oral discussion (through videoconference) on **November 24<sup>th</sup> pm, 2021**. The final selection will be performed in collaboration with the [Doctoral School](#) of Bordeaux University through its competitive examination process.