

POSTDOC position at INRA, System lab, Montpellier, France

Modelling intercrops with the STICS soil-crop model: model adaptation for simulating intercrop management scenarios *within the framework of the H2020 European project ReMIX*

Starts 1st December 2018, for 18 months

Position short description: We are seeking a young researcher in agronomy/agroecology/ecology and soil-crop modelling who will work on modelling intercrops (species mixtures) using soil-crop models and agronomic analyses to assess the efficacy and the resilience of intercrops versus sole crops under climate change scenarios. This work will allow writing publications that can be submitted to high-ranked international scientific journals.

Context:

The STICS soil-crop model (Brisson et al., 1998; 2002; 2003; 2008) is widely used for sole crops in various national and international projects (e.g. AgMIP, MACSUR initiatives). This model simulates the water, C and N cycles at a daily step at cropping system scale and is able to represent a wide range of crops and cover crops. It includes formalisms to simulate the effect of temperature and CO₂ concentration on biomass production, yield, and its consequences on environmental outputs. Its robustness and accuracy have been extensively evaluated (Coucheney et al., 2015). Nevertheless, its intercrop-version (Brisson et al., 2004) has not been widely used for bi-specific mixtures (intercrops), except for spring barley/pea mixtures (Launay et al., 2009). For its more extensive use, we have seen that the STICS-intercrop version needs some improvements and a more broad evaluation in order to be able to simulate different intercropping scenarios (pe-doclimatic, management, climate change).

For more detail on STICS soil-crop model, you can look at the following web page:

https://www6.paca.inra.fr/stics_eng/

The ReMIX project is an H2020 European project, which aims at exploiting the benefits of species mixtures in designing more diversified and resilient agro-ecological arable cropping systems less dependent on external inputs. The goal of ReMIX is to contribute to the adoption of productive and resilient agricultural systems based on plant diversity, to increase legume production and competitiveness in the EU and to healthier diets based on plant proteins from intercrops of cereals and legumes. ReMIX will produce new knowledge that is both scientifically credible and socially valuable in conventional and organic agriculture. Based on a multi-actor approach, it will tackle practical questions and co-design ready-to-use practical solutions adapted to produce mainly grain cash crops under diverse European pedo-climatic conditions. In ReMIX, the modelling approach will be used in complementary to experimentation in order to tackle questions dealing with the efficacy of intercrops. Models are aiming at 1) unravelling mechanisms of plant-plant interactions to maximise resource use efficiency, 2) identifying key traits and creating novel breeding and phenotyping methods and tools adapted to species mixtures, and 3) developing new agricultural practices to optimise species mixtures performance.

For more detail on ReMIX project, you can look at the following web pages:

<http://www.remix-intercrops.eu>

<https://twitter.com/remixintercrops>

<https://www.facebook.com/RemixIntercrops/>

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Position description: the young researcher will be in charge of testing, parameterise and “validate” the STICS soil-crop model for its intercrop version (Brisson et al., 2004; Launay et al., 2009). The ability of STICS-intercrop to simulate the dynamic interspecific competition and complementarity by the two intercropped species for the resource capture (light, CO₂, water and nitrogen) will be particularly analysed i) for testing new formalisms recently implemented for improving the energy balance for intercrop designs, and ii) using existing databases of various types of intercrops. The work will also aim at evaluating the type of “phenological plasticity” and other “emerging properties” that can be simulated by STICS-intercrop. Finally, this will allow determining the validity domain of STICS-intercrop for intercropping systems.

The young researcher will work in close collaboration with a small group of researchers working on modelling in the STICS team (Eric Justes, CIRAD Montpellier; Marie Launay, Dominique Ripoche, INRA Avignon) and/or in the ReMIX project (Noémie Gaudio, INRA Toulouse; Sebastian Munz, Univ. of Hohenheim, Germany).

The final goal is to have a version of STICS that allow to correctly simulate various types of intercrops, i.e. with different spatial patterns (in alternate rows or mixed on the row), composed of various arable crops (e.g. wheat or barley / pea or fababean; sunflower / soybean; wheat / maize) and under various types of management, pedoclimatic conditions and climate change scenarios.

This position may be extended by 1 year in case of success to other calls (under construction).

Qualifications and skills:

- PhD in agronomy/agroecology/ecology AND modelling in plant or soil science
- Knowledge in modelling needed, with experience in computer programming (whatever the language)
- Background in cropping or agroforestry systems and agronomy or ecophysiology or ecology appreciated
- Background in statistics and data analysis needed
- Strong ability to work autonomously and interact with other researchers
- Strong scientific writing skills for publication in scientific journals

Employment and practical conditions:

Post-doc position for **18 months** at UMR SYSTEM, Montpellier; the post-doc will be formally employment by INRA

Net salary: 1800 euros/month up to 2000 euros/month depending on experience.

All social security and pension contributions are supported by INRA.

Access to on-site to restaurant of SupAgro Montpellier / INRA for lunch at subsidized price.

INRA Centre and UMR SYSTEM are located in the centre of Montpellier, well connected to public transportation.

Person to be contacted:

Dr Eric JUSTES (scientific coordinator of ReMIX project and Head of STICS model)

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CIRAD, UMR SYSTEM, Montpellier (France)

https://www.researchgate.net/profile/Eric_Justes

SYSTEM lab is a Joint Research Unit (UMR) gathering researchers from CIRAD, INRA, SupAgro Montpellier and CIHEAM-IAMM; To see SYSTEM lab web site where the applicant will be located: <https://umr-system.cirad.fr/en>



To apply: Application to be sent no later than 12th October, 2018 by e-mail only

Please apply only if you have the requested skills in modelling, and send the following information to Eric Justes:

- Your CV including publications;
- A letter of interest;
- The name and addresses of two referring persons.



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