Master 2 Internship Opportunity

Preventing Agro-Climatic Runaway: Modeling Climate Change Feedback Loops in Life Cycle Assessment (LCA)

The French National Research Institute for Agriculture, Food, and Environment (INRAE) is a major player in research and innovation. It is a community of 12,000 people with 272 research, experimental research, and support units located in 18 regional centres throughout France. Internationally, INRAE is among the top research organisations in the agricultural and food sciences, plant and animal sciences, as well as in ecology and environmental science. It is the world's leading research organisation specialising in agriculture, food and the environment. INRAE's goal is to be a key player in the transitions necessary to address major global challenges. Faced with a growing world population, climate change, resource scarcity, and declining biodiversity, the Institute has a major role to play in building solutions and supporting the necessary acceleration of agricultural, food and environmental transitions.

CONTEXT AND MISSIONS

Climate change is already reshaping agriculture around the world. Rising temperatures, shifting weather patterns, and more frequent extreme events are putting pressure on crops and livestock, in different ways across regions (Intergovernmental Panel On Climate Change (Ipcc), 2023). One lesser-known effect is that climate change can actually make agriculture's own environmental footprint bigger. For example, when yields drop, more land is needed to grow the same amount of food — which means more greenhouse gas emissions. Between 1992 and 2020, this effect led to an extra 21.8 Gt of CO_2 emissions due to cropland expansion (You et al., 2025).

Why this matters for Life Cycle Assessment (LCA)
With better climate projections and agroclimatic models now available, there is a unique opportunity to bring climate feedbacks directly into assessments such as the standardized LCA framework. LCA is widely known and used to support decision-making such as in food and agricultural policies.
Consequential LCA focuses on the environmental consequences of decisions by modeling chains of cause and effect (Brandão et al., 2024; UNEP, 2011). However, most current studies stop short of including the feedback loops between emissions, climate change, and future agricultural impacts — even though the idea has been around for a while (Weidema et al., 2018).
Imagine this loop: 1 kg of CO_2 emitted today contributes to climate change. In the future, this leads to lower crop yields, which means more inputs (land, fertilizer, energy) are needed, causing more emissions — and so on. Capturing this "vicious circle" is essential to overcome the current short-sightedness of LCA, to better represent escalating environmental crises and make decisions to break the circle.

Your mission
As an intern, you will help lay the foundations for including these climate feedbacks in LCA. Your work will consist of estimating the amounts of additional agricultural inputs linked to marginal greenhouse gas emissions by contributing to the conceptual and computational model and reviewing the scientific literature on how climate change affects agriculture.

This exploratory work will feed into the development of a future LCA module that represents climate feedbacks.
This internship is ideal for students interested in sustainability, climate science, and modeling. You will join an active research team and contribute to a cutting-edge topic with real-world impact, and will thus gain important research skills together with LCA modeling abilities.

WHO WE ARE LOOKING FOR

▪ A highly motivated Master 2 Student with interest and skills in quantitative environmental sciences and/or agricultural sciences. Experience in LCA is appreciated. Do not hesitate to apply if you are motivated!

RESEARCH TEAM

You will be hosted within the ITAP research unit (a joint unit between INRAE and Institut Agro, Montpellier), located at Institut Agro Montpellier on the La Gaillarde campus (about a 10-minute bike ride from the city center and the train station). Within ITAP, you will join the ELSA research team composed of 12 researchers and engineers specialized in LCA modeling.

Pierre Jouannais (Research Scientist/Associate Professor) who is working on advanced LCA modeling including environmental feedbacks will supervise the internship.

↘ Practical information

▪ UNIT : UMR ITAP

▪ Location : Montpellier

▪ Contract : 4-6 months internship

▪ Start date : Around February 2026

▪ Holidays : 2.5 days/month

▪ Monthly stipend: Around 600 euros

↘ How to apply

CV and motivation letter to

pierre.jouannais@inrae.fr

📅 Application deadline: **15/11/2025**

REFERENCES

Brandão, M., Weidema, B.P., Martin, M., Cowie, A., Hamelin, L., Zamagni, A., 2024. Consequential Life Cycle Assessment: What, Why and How?, in: Encyclopedia of Sustainable Technologies. Elsevier, pp. 181–189. https://doi.org/10.1016/B978-0-323-90386-8.00001-2

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UNEP, 2011. Global Guidance principles for life cycle assessment databases. Shonan Guidance Principles 160.

Weidema, B.P., Schmidt, J., Fantke, P., Pauliuk, S., 2018. On the boundary between economy and environment in life cycle assessment. Int J Life Cycle Assess 23, 1839–1846. https://doi.org/10.1007/s11367-017-1398-4

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