Internship Opportunity: Calibration, Evaluation, and Application of a 3D Plant Growth Model of Oil Palm

Subject Overview

Are you passionate about plant science, sustainability, and cutting-edge technology? This internship offers a unique chance to immerse yourself in the world of plant modelling and make a tangible impact on sustainable agriculture. You'll join our PalmStudio research project team to advance a 3D growth and development model for oil palm (*Elaeis guineensis*), supporting the development of innovative sustainable management practices.

Project Background

In this role, you'll work on XPalm, a state-of-the-art functional-structural plant model (FSPM) we've designed to simulate the development of oil palms down to individual organs—leaves, inflorescences, and fruits. Our goal is to optimise palm growth predictions based on climate, soil, and genetic data, enabling smarter cultivation strategies. This work aims to maximise productivity within existing agricultural areas, helping to reduce the pressure to expand into forested regions and contributing to the broader goal of mitigating deforestation. This modelling tool could also help explore innovative systems by changing planting design and integrating intercrops for more resilient agricultural systems.

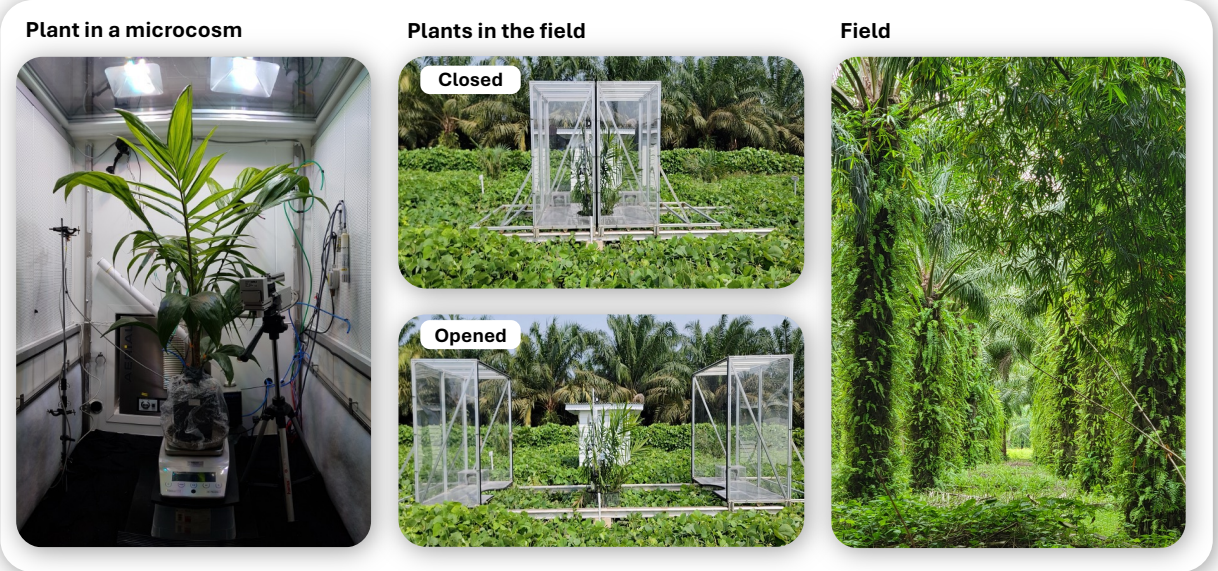

Figure 1. Illustration of the comprehensive database on oil palm. Left: Data acquired in controlled conditions in Montpellier's Ecotron; Centre: Data acquired on plants in the field at an early stage; and Right: Data acquired in the field in Indonesia, Benin, and Nigeria.

Your Role and Responsibilities

As a Master 2-level intern, you'll engage in model calibration using a rich, multi-source dataset: field data from Indonesia, Nigeria, and Benin; controlled experimental data from Montpellier's European Ecotron; and ongoing field monitoring data (Figure 1). Key tasks include:

- **Mastering XPalm** – Understand the inner hypothesis and models of our growth model.
- **Evaluation Pipeline** – Create streamlined, efficient workflows to analyse and validate model outputs.
- **Calibration Pipeline** – Build a powerful calibration framework using our diverse dataset.
- **Sensitivity and Error Analysis** – Use PlantSimEngine.jl to run parameter sensitivity tests and MonteCarloMeasurements.jl to track error propagation.
- **In-Silico Experimentation** – Perform virtual studies to predict how palm growth and productivity shift across varied environments or management practices.

Ideal Candidate Profile

We're looking for students with modelling skills and a background in plant science (*e.g.*, agronomy, ecophysiology) paired with some statistical and programming knowledge. While experience in Julia programming is a plus, curiosity and a willingness to learn are key!

Why Join Us?

Based in Montpellier, you'll be part of the FSPM team at UMR AMAP, Cirad (Centre de coopération internationale en recherche agronomique pour le développement), and collaborate with AGAP institute and the Macs4Plants network, a passionate group of scientists and engineers dedicated to modelling plants to address global agricultural challenges.

Period

The internship is funded for 6 months starting early 2025 (January-March).

How to candidate?

Send us a CV and short motivation letter by email to our three email addresses:

Rémi Vezy (AMAP): remi.vezy@cirad.fr
Raphaël Perez (AGAP): raphael.perez@cirad.fr
Thomas Arsouze (AMAP): thomas.arsouze@cirad.fr