Research Project

CIGE project

Understanding Genotype x Environment Interaction in oil palm

Background. **Oil palm** is the major vegetable oil source in the world and is historically grown under humid tropical climate. These last decades, its cultivated area extended to more marginal zones, less adapted to its ecology. The breeding programs thus have to take into account the specific adaptation of the genetic materials to the met constraints, as periodical water deficit (that are expected to increase with climate change), high hygrometric demand (VPD), low solar radiation, or high and low temperatures. A first step is to explore the G x E interactions across sites and genotypes. For this purpose, a set of 20 materials differing by their genetic origins and field performances were planted in three climatic contrasted sites, in Benin, Nigeria and Indonesia.

Objectives

CIGE aims : 1) to compare the phenological development, growth and yield of the genotypes on the three sites ; 2) to characterize the genotypic responses to water deficit and high VPD periods ; 3) to identify the underlying adaptive mechanisms to both constraints ; 4) to identify plant traits associated with tolerance in order to propose selection criteria.

Plantations have been conducted in 2010, 2011 and 2012 in Nigeria, Indonesia and Benin respectively. Observation rounds are organised every two weeks, at the phytomer level. A same field protocol has been used in the three sites allowing to build a common database.

Two complementary and interactive approaches are used: 1) prediction models based on neuronal networks are run and test combinations of climate variables, phenotypic traits and time windows ; 2) the most relevant trait combinations are used to analyse the genotypic sensitivity to the different constraints, that helps do identify back new and more relevant traits to be used into the models. In parallel, the genotypes at the juvenile stage are tested in controlled environment for soil water deficit and high VPD tolerance.

Duration

4th phase : Jan 2021 – Dec 2023

Leader

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Geographical Dimension

Benin, France, Indonesia, Nigeria

Partners

Smart-RI, Inrab, Siat, Cirad, PalmElit

Funding

PalmElit

Keywords

Oil palm, sex determination, abortion, yield, growth, water deficit and high VPD tolerance