

**Year of CfP: 2009**

**Project No 0902-010**

<b>Project title:</b> PHENOTyping by Modelisation of plant ENvironnement and Architecture (PHENOMENA)
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**Unit managing the project:** EMMAH (Mediterranean environment and modelling of agri-hydrosystems) [INRA]

**Project leaders:** Benoît de Solan (EMMAH) [benoit.desolan@avignon.inra.fr] and Christophe Pradal (DAP) [christophe.pradal(a)cirad.fr]

**Research units from the Foundation's scientific network involved:** DIADE

**Subthematic axes:** IPB-1 (Integrative Plant Biology 1: *Genetics and genomics, plant breeding, ecophysiology*), STDI-1 (Socio-Technical Dynamics of Innovation 1: *Agri-environmental innovations, agri-ecosystems, resources management*)

**Objectives:**

Agriculture is facing huge challenges: it must combine both a high productivity to balance the increasing food demand and a limited environmental footprint to make the system sustainable. Further, climatic changes impose very strong constraints, particularly in the Mediterranean regions that will be particularly affected. Plant breeding has always been a major component in the past for production increase. It will be also a major tool in the adaptation of agriculture systems to face the above challenges. The success of the selection depends on our capacity to identify and quantify traits that are favorable such as improved resistance to pests and stresses or better use of nitrogen. New techniques allowing to access specific traits of cultivars have to be developed based on non destructive and rapid measurements such as offered by close range remote sensing known as "proxidetection". This technique allows the characterization of some of the main canopy variables that intervene in canopy functioning. However, the interpretation of such measurements is complex and relies on the way canopy architecture is modelled and linked to plant functioning.

The objective of this project is to combine a 4D plant model with a functioning model as a support to improve field high throughput phenotyping with remote sensors. This work will be based on two existing models, the SIRIUS crop functioning model and the ADEL-Wheat architectural model. Implementation will use the modelling platform OpenAlea, dedicated to functional structural modelling of plants.

The coupled model will then be used to simulate reflectance and gap fraction with a radiative transfer model.

**Total Agropolis Fondation funding:** €96,832 (allocation for a post-doctoral fellow, travel expenses, participation to 2 conferences)

**Funding category(ies):** Agropolis Fondation postdoctoral fellowship

**Project duration:** 01 January 2010 - 31 July 2012

**Keywords:** structural functional model - OpenAlea platform – canopy – proxidetection – remote sensors – phenotyping – modellisation -