

Year of CfP: 2010

Project 1001-009

Project title: Ecological services of legumes for nitrogen and phosphorus biogeochemical cycles and C sequestration in cereal cropping systems in Africa and the Mediterranean basin

Unit managing the project: UMR ECO&SOLS (Functional Ecology and Bio-geochemistry of Soils and Agro-ecosystems (CIRAD, INRA, IRD, Montpellier SupAgro))

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Countries involved in the project: Madagascar, Tunisia, Morocco, Senegal, Mali, Burkina-Faso, Algeria, Egypt

Research units from the Foundation's scientific network involved: LSTM, INNOVATION

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*), STDI-3 (Socio-Technical Dynamics of Innovation 3: *Innovation processes, social management of innovations*)

Objectives:

The Fabatropimed project is one of 3 major, collaborative projects being supported by the Agropolis Foundation from 2011 onwards. Over a four (4) year period it brings together 15 research teams from the Ecology & Soil, Innovation, and Tropical and Mediterranean Symbiosis Laboratory (LSTM) Mixed Research Units and the SCA Analytical Laboratory and Diascope units of the Montpellier campus, in partnership with Mediterranean and Tropical African agro-ecosystems.

The target of Fabatropimed is to enhance the benefit of pulses for cereal growing systems and the environment, by (1) reducing the use of mineral-based fertilisers and increasing carbon-dioxide sequestration, and by (2) promoting the interaction between soil micro-organisms for plants to acquire and use nitrogen and phosphorus. Fabatropimed is carrying out cooperative research in six agro-ecosystems using agricultural and environmental diagnostics (WP1) together with a sustainability and innovation survey (WP5), in interdisciplinarity with monitoring the C, N and P soil cycles and the atmosphere (WP2). To this is added the characterisation of the microbial, symbiotic and rhizospheric functional diversity (i.e. in the areas influenced by roots) (WP3) and research into genes for the effective acquisition and use of phosphorus for the symbiotic fixation of nitrogen (WP4). The research work is carried out as part of 12 doctoral projects, jointly organised by an Agropolis researcher and his African partner, generally co-supervised as part of international programmes.

These researches have in common a functional ecological approach to plant-micro-organism-soil-atmosphere interactions with three pulse species: *Phaseolus vulgaris*, *Vicia Faba* and *Vigna unguiculata*, in rotation or association with sorghum in the zai of Yatenga (Burkina Faso), rice and maize in the Ivory tanety (Madagascar), durum wheat in the Medjerda valley (Tunisia), the perimeter of Haouz (Morocco) and the Setif plateau (Algeria).

The alternative, biological and organic technologies that emerge will be assessed in a network of groups of producers where digital models, MOMOS and MIN3P will be applied simultaneously to simulate C, N and P cycles in the soil and the rhizosphere. The comparative approach to agro-ecosystems will distinguish the generic conservation and resilience mechanisms of the C, N and P biochemical cycles from those that are specific to the ecosystems. Fabatropimed treats pulses as ecological engineers of the biological operation of soils, in this way making a specific contribution within the context of international cooperation for food and environmental safety, together with the FAO, IAEA, CIAT, ICARDA, IITA and ICRISAT of the CGIAR, and projects such as Ripiecsa and N2 Africa.

Total Agropolis Fondation funding: €1,000,000

Funding categorie(s): Doctoral Fellowship, Post-doc Fellowship, Overseas Travel Grant for Doctoral and Post-doctoral scientists, Support for publication and dissemination of results

Project duration: 01 December 2010 – 31 March 2015

Keywords: phosphorus, nitrogen, rhizobial symbioses, microorganisms, legumes; soil, nitrogen fixation