

**Year of CfP: 2009**

**Project No 0901-005**

**Project title:** Coupling of C, N & P biogeochemical cycles in nodulated legume rhizosphere in agroecosystems of reference areas of the Mediterranean basin (SeqLeg)

**Unit managing the project:** Eco&Sols (Soil and Rhizosphere Biogeochemistry) [INRA, IRD, Montpellier SupAgro]

**Project leader:** Jean-Jacques Drevon [drevonjj(a)yahoo.fr]

**Countries involved in the project:** Tunisia, Algeria, Syria (ICARDA) & India (ICRISAT)

**Sub-thematic 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:**

The interest of grain-legumes for Mediterranean agriculture is to decrease the dependency on imports of plant proteins and to increase the diversification of cereal cropping systems. Legumes contribute to food security and soil fertility in particular as a consequence of the symbiotic nitrogen fixation (SNF). But they face yield instability because of biotic and abiotic constraints, including low P availability in most soils of the Mediterranean basin.

The hypothesis to be tested is that C sequestration would increase in cultural systems with legumes that would contribute more than 50% of their N content from atmosphere thanks to their symbiotic capacity to fix N<sub>2</sub>. This contrasts with the non N-fixing species that require addition of (energy costly) mineral N to fix more CO<sub>2</sub> through their photosynthesis, thus eliminating the benefit of C sequestration by counter-part emission of CO<sub>2</sub> for the production of N fertilizer. In conclusion legumes would increase the overall C sequestration by fixing N<sub>2</sub>. However soil P may be limiting the N<sub>2</sub>-dependent legume photosynthesis and growth. Therefore, it is necessary to investigate the interaction between atmospheric N<sub>2</sub> fixation and soil P availability.

Bean (*Phaseolus vulgaris*) recombinant inbred lines contrasting in P efficiency for SNF have been obtained in cooperation with CIAT (Colombia). The objective of this project is to analyze the interactions between the biogeochemical cycles of C, N and P in the rhizosphere of legumes, by comparing the C, N and P accumulation in these recombinant inbred lines of common bean and their rhizospheric soil in reference zones of the Mediterranean basin.

These data will be used with the MOMOS model to assess the contribution of the N<sub>2</sub>-fixing rhizobial symbiosis to the carbon sequestration resulting from residues decomposition in the soils, and to the up-scaling at the regional scale.

**Total Agropolis Fondation funding:** €42,640 (running costs, travel expenses, organisation of a workshop)

**Funding category(ies):** Agropolis Fondation small grants (support for small exploratory, risky and innovative projects, « proof of concept », new frontier research...)

**Project duration:** 01 September 2009 - 31 December 2012

**Keywords:** rhizosphere – Mediterranean – agroecosystems- nodules – symbiotic nitrogen fixation