Joint French-South-East Asia Research and Training initiative

DYNAMIC OF LAND USE CHANGES AND SOIL ECOSYSTEM SERVICES (LUSES)

Internal Call for small proposal

Year 2013

Project responsible	Bernard Barthès (IRD, Eco&Sols, Montpellier)

Title
Building NIRS calibrations for soil carbon under rubber plantations in Thailand

LMI partners (French)	Frédéric Gay (CIRAD, UMR Eco&Sols)
	Michaël Clairotte (INRA, Eco&Sols, Montpellier)

LMI partners (Asian)	Suthisak Saengtharatip, PhD student (KU)
	Saengdao Khaokaew (KU)

Others Partners	
Western Countries	
Asian Countries	

Type of support	**Amount (€)**
Deadline (14 th of February)	
Student support	
Student research expenses	3000
Student mission	
Support to project building	
Collective training expenses	
Mission (exploratory, support)	
Field support	
Exploratory project	
Beside project support (link to a bigger one)	
Equipment	
Others	

Asian Countries involved (put an x)

Thailand	Vietnam	Laos	Others
X			

Working package involved (put an x)

WP1 Soil fertility and the dynamics of mineral nutrients	**WP 2 Soil and water functional biodiversity**	**WP 3 Carbon storage in plant biomass and soil**	**WP4 Regulation of water flow and erosion** s
		X	

General context of the proposal

Soil carbon (C) in rubber plantations represents a large C sink in Thailand, which could be considered in the national C balance. However, the amount of soil C in rubber plantations is not well documented, and particularly its evolution over the lifetime of plantations. Addressing this question requires to measure C over large sets of samples, which is tedious and/or expensive using conventional determinations (dry combustion or sulfochromic digestion).
Near infrared reflectance spectroscopy (NIRS) is a time- and cost-effective approach for determining soil C. This approach depends on calibrations, which express C in function of NIR spectra, and thus requires conventional (dry combustion) and spectral (NIRS) characterizations over "learning" sets. Once built, calibrations are used to predict C from NIR spectra for sample types comparable to those of the learning sets.
Suthisak Saengtharatip is a Thai student who will begin a PhD, one main objective of which being to build robust NIRS calibrations for soil C over a range of rubber plantations in Thailand.

Objective of the proposal

The objective of the proposal is to support the analytical budget of Suthisak Saengtharatip's PhD. One of the main objectives of the PhD is to build robust NIRS calibrations for soil C under rubber plantations in different regions of Thailand. Further, this will help monitoring soil C for better soil management, and better account of rubber plantations in C budgets.

Link with the LMI project (regional aspect, partnership, working package)

This project will be part of the WP 3 (Carbon storage in plant biomass and soil) of LUSES, as it meets one of its deliverables: the development of quick and reliable methods to determine soil C. It will support the analytical budget of Suthisak Saengtharatip's PhD, and will thus contribute to capacity building, which is an important objective of LUSES.
The project will also be connected to the Eco-Rubber project* funded by the French IFC foundation (Institut français du caoutchouc, i.e. French institute for rubber) and driven by members of LUSES.
Considering that funding by IFC will not necessarily be available at the beginning of the PhD, it seems relevant to rely first on alternative funding provided by LUSES.

* Impact environnemental des plantations d'hévéa sur la biodiversité et la séquestration du carbone, i.e. Environmental impact of rubber plantations on biodiversity and carbon sequestration.

Project description (one page maximum)

The objective of the proposal is to support the analytical budget of Suthisak Saengtharatip's PhD. One of the scientific objectives of the PhD is to build robust NIRS calibrations for soil C under rubber plantations in Thailand. NIRS allows cost- and time-effective characterization of large numbers of samples, thus better soil knowledge, better soil monitoring, and better land management. The PhD also has the objective to contribute to capacity building in terms of NIRS applications to soils in Thailand.
The plantations sampled will represent chronosequences and toposequences, in the South (traditional rubber area) as well as in the East and Northeast (extension areas). They will be identified at the beginning of the PhD of Suthisak Saengtharatip.
The soils will be sampled at different depths (to be specified at the beginning of the PhD). The samples collected will be analyzed for C by dry combustion, and their NIR spectrum will be acquired. Then calibrations will be built to express C in function of spectra; this will allow inferring C from spectra, for soils represented by the calibration sets, which have thus to be representative of a wide range of plantation soils. Analyses will be carried out in Montpellier (Eco&Sols laboratories).
In a first step, a sample population of 1200 samples could be studied. All samples will be scanned in the NIR, and 300 will be analyzed by dry combustion for C determination; this represents 25% calibration intensity, which seems reasonable according to literature (Grinand et al., Eur. J. Soil Sci., 2012).

Budget description including identify amount budget from co -funding if it is available

300 soil C analyses (CHN) x 3.60€/sample	= 1080€
1200 NIRS analyses x 1.60€/sample	= 1920€
TOTAL	= 3000€