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	Jean-Louis Janeau

Title
Characterization of hydrodynamic properties, dissolved organic carbon and bacterial abundance: a rainfall simulation experiment

LMI partners (French)	
	ECO&SOLS, BIOEMCO

LMI partners (Asian)	
	Land Development Department (Thailand) – National Park, Wildlife and Plant Conservation Department (Thailand) – Soils and Fertilisers Research Institute (Vietnam) – Institute of Chemistry (Vietnam) – Institute of Environmental Technology (Vietnam) – National Agricultural and Forestry Research Institute (Laos)

Others Partners	
Western Countries	….
Asian Countries	

Type of support	**Amount (€)**
Deadline (14 th of February)	
Student support	
Student research expenses	
Student mission	
Support to project building	
Collective training expenses	**3600**
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
✓ Land Development Department. ✓ National Park, Wildlife and Plant Conservation Department.	✓ Soils and Fertilisers Research Institute ✓ Institute of Chemistry ✓ Institute of Environmental Technology	✓ National Agriculture and Forestry Research Institute	

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	**X**	**X**

General context of the proposal

LUSES is dedicated to promote regional research exchanges between the members and to train them to use specific research tools. In 2012, a rainfall simulator was financed by LUSES. In March 2013, a specific field experiment in Vietnam will be organised by the JEAI-BioGEAQ, with a specific involvement of SFRI, ICH and IRD. This experiment will address the question of organic matter export from forested soils at the field scale, embedded in the research project of the JEAI-BioGEAQ.

Objective of the proposal

Capacity building through participation in research activities with focus on the observation of natural conditions and reliable data collection.

To provide the regional partners of LUSES with a specific field research experience at the $1m^2$ scale with the objective of understanding the impact of shifting land use change (crop to silviculture) on soil processes.

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

The work packages WP2, WP3 and WP4 are concerned by this experimental approach which aims to develop the application of ecological engineering in the region through the rainfall simulation.
The experimental research will be developed at the field site close to Hanoi within the MSEC catchment. It provides an ideal opportunity to organize an active participation between Lao, Thai and Vietnamese partners thus reinforcing the regional partnership between different research organizations (institutes, universities).
To characterize the bacterial abundance, the samples obtained during the experiment could be analyse in LDD Bangkok.

Project description (one page maximum)

During 5 days in the field, the participants will be focus on the use of a rainfall simulator and accessories to collect the main parameters of the hydraulic conductivity and to quantify the soil detachability. Due to the presence of this equipment in Vietnam, this training will be the first one in this country but in 2014 and 2015, we plan to move the equipment in Thailand and Laos to compare different soil hydrodynamic characteristics in catchment managed by the LUSES partners.
Since 2000, the dynamics of water flux and soil erosion have been characterized in small, upland catchments in Laos, Thailand and Vietnam (Valentin et al., 2008). One of these, located in the North of Vietnam, close to Hanoi has experienced a large change in land use over this period (Jouquet et al., 2012; Podwojewski et al., 2008). This twelve year period has seen the shift from cash crops (manioc, maize) towards silviculture with the intensive plantation of the Acacia *mangium* trees, particularly on steep slopes where erosion rates are high.
This experiment will use rainfall simulations to characterize soil detachability under acacia plantation cover with a specific focus on organic matter loss and bacterial abundance in water runoff.

Two series of rain simulations will be conducted on each plot. A total of six 1 m^{-2} steel plot frames will be used. Two types of land use will be tested in triplicate and for each simulation, a rain intensity of 90 mm h^{-1} during 40 min (~585 J m- ²) will be sprinkled on the plot. Runoff volume, soil loss, bacterial abundance and OM export (inorganic nutrients (N, P) and dissolved organic carbon (DOC) concentration) will be determined in runoff water that was collected at the outlet of the metallic frame.
Soil features characteristics playing a major role on runoff water will be described and the bulk density and moisture contents will be determined.

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

Partner involved:

2 partners from Laos

- ✓ Alounsawath Chanphengxay (NAFRI, Laos)
- ✓ Keo Oudone Latsachak (IRD/NAFRI, Laos)

2 partners from Thailand

- ✓ Settha Khosukh
- ✓ 1 Land Development Department (Chiang Mai - North Thailand)

Partners from Vietnam participating to the experiment (co-funded by JEAI-BioGEAQ):

- ✓ Tran Sy Hai (Rainfall simulation specialist)
- ✓ Pham Van Rinh (Hydrology)
- ✓ Tran Minh Tien (soil quality)
- ✓ Luu Thi Nguyet Minh (nutrients)
- ✓ Ho Tu Cuong (Bacterial abundance)
- ✓ Le Thi Phuong Quynh (DOC)

Budget:

Travel to Hanoi - 300€	4 X 300	= 1200€
Per diem and accommodation - 80€/day	4 X 6 days X 80	= 1920€
Car renting for transportation to the field - 80€/day	1 X 6 days X 80	= 480€
	Total	= **3600€**

Co-funding:

The costs of the complete experiment and for the participation of our colleagues from Vietnam are in charge of JEAI-BIOGEAQ and IRD-BIOEMCO budgets (4200€).

References

Jouquet, P. et al., 2012. Influence of earthworms and termites on runoff and erosion in a tropical steep slope fallow in Vietnam: A rainfall simulation experiment. Applied Soil Ecology, 61: 161-168.

Podwojewski, P. et al., 2008. Land-use impacts on surface runoff and soil detachment within agricultural sloping lands in Northern Vietnam. Catena, 74(2): 109-118.

Valentin, C. et al., 2008. Runoff and sediment losses from 27 upland catchments in Southeast Asia: Impact of rapid land use changes and conservation practices. Agriculture Ecosystems & Environment, 128(4): 225-238.