



**Joint French-South-East Asia Research and Training initiative**

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



**Report on a the collective training  
“How to monitor Soil Biodiversity”  
3 to 14<sup>th</sup> of November 2014**





**Title:** Soil biodiversity and activity: from sampling to data analysis

Organization committee:

Kanika Sajjaphan, Associate Professor at Kasetsart University

Pusanisa Heepngoe, PhD student at KU

Monrawee Peerawat, Researcher at LDD Dept Biotech, PhD student at KU

Alain Brauman, IRD, LDD

Savitree Sriratampai, LDD-TICA, assistant of LMI LUSES

Pissamai Chantuma, CRCC DOA.

**Date :** 3st to the 13th of November 2014

**Participants:** 14

No.	Name	Surname	Institutions	Country	Email Address
1	Naunjan	Pasda	LDD Biotech	Thailand	nuanjun24@hotmail.com
2	Monrawee	Peerawat	LDD Biotech	Thailand	monraweepeerawat@gmail.com
3	Panthip	Panklang	LDD region 11	Thailand	nan_phantip@hotmail.com
4	Sukanya	Taweekit	LDD region 5	Thailand	spromsakha@yahoo.com
5	Pusanisa	Heepngoen	KU	Thailand	kero_peach@yahoo.com
6	Pisamai	Chantuma	CRCC	Thailand	pisamai41@hotmail.co.th
7	Warurilne	Kamla	CRCC	Thailand	-
8	Napaporn	Mona	CRCC	Thailand	-
9	Treenuch	Promnok	KKU	Thailand	som_treenuch@hotmail.com
10	Papatsara	Machaiyaphum	KKU	Thailand	papatsara.nat@gmail.com
11	Porntip	Puttaso	KKU	Thailand	nuchdy_p@hotmail.com
12	Pascal	Lienhard	DP Cansea	Lao	pascal.lienhard@cirad.fr
13	Soulikone	CHAIVANNA	Dalam	Lao	schai vanhna@yahoo.com
14	Nguyen	Thao Nhung	SFRI	Vietnam	thaonhung.nguyen@gmail.com

**Trainers:**

- Jean Trap (IRD, LMI LUSES, UMR ECO&SOLS)
- Alain Brauman (IRD, LMI LUSES, UMR ECO&SOLS)
- Thibaud Decaëns Prof. Univ. Montpellier (CEFE, UMR 5175 CNRS)

**Localization:**

- 3 to 6th of November: CRRC Rubber platform in Chachoengsao
- 10 to 13<sup>th</sup> of November: Kasetsart University, Dept of Soil.

**LMI scientific project support:** Tree plantation and soil

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



## Total budget 8165 €

	<b>Budget required</b>	<b>Designation</b>
<b>KU</b>	1000	Training facilities, scientific and basic molecular equipment ie. stereo microscope (10 to 12) PCR and two staff as resource persons as well as one post graduate students to join the course.
<b>LMI LUSES</b>	4564	Mission and accomodation of Thibaud Decaens, participation to lab expenses. accomodations for two vietnam sans Lao tudents.
<b>IFC</b>	2000	Mission and accomodation of jean Trap (from France), Trip and accomodations for two vietnam students.
<b>CANSEA</b>	600	Participation of Pascal Lienhard and one researcher from NAFRI

## General and specific objective

**General:** Learn how to characterize the soil fauna biodiversity and activity (OM decomposition) in a perennial plantation

### Specific

1. Design a soil fauna survey sampling (block design, intra and inter replicates)
2. Identify and characterize the soil macrofauna diversity at the order or family level
3. Characterize the impact of soil macrofauna on soil functioning (organic matter decomposition pattern) via the:
  - a. Description of the humus layer of the soil (see humus index)
  - b. The use of an indicator of soil functional activity (lamina bait technique)
4. Organize data (contingence table) and analyse them on excel (use of pivot table)
5. Give a first Initiation to multivariate analysis (Principal Component Analysis)

## Specificity and originality of the training

The main purpose of this training was to initiate the participants to a research approach in soil ecology. For this purpose, we decided to:

- Link this soil survey to a defined research question (impact of plantation age on soil fauna community structure and activity)
- To undergo a "learning by doing" approaches
- To link data collection, data organization and statistic analyses in a same training.

Thus, the originality of this training lies on the continuous curriculum from field tasks (such as soil fauna sampling and humus form description) to laboratory tasks (fauna identification, litter weighting) and data exploitation using statistical analyses. This training provide important and central ecological tools for students in the analysis of land uses impacts on ecosystem services.

## Context of the training: Why it's important to study soil fauna diversity and activity

Soil is one of the most diverse environment of earth (~25% of global biodiversity in terms of



species), but also one of the least known concerning its biodiversity (less than ~ 10% of described species). From a functional point of view, soil organisms (including plants) provide crucial ecosystems functions that supply important ecosystem services. For instance, decomposers are responsible for chemical transformations of organic matter and nutrient cycling and macro-invertebrates (earthworms and arthropods) are able to alter, physically and permanently, the environment of others species. Bioturbation activities of earthworms have a major impact on the spatial structure of the soil, the incorporation of organic matter in the soil and microbial activity. ***Any changes in soil biodiversity, as induced by land use changes, may impact the whole functioning of the ecosystem, and in particular, its productivity, which is a central ecosystem service.***

## Training schedule

- 2<sup>nd</sup> November: Arrival of the trainees in Bangkok
- 3<sup>rd</sup> November:
  - Morning Transfer to Chachoengsao
  - Afternoon: Lamina baits installation (protocol in appendix 2)



- 4<sup>th</sup> to 6<sup>th</sup> November: Data collection
  - o macrofauna surveys (for protocol see appendix 3)



- humus index, litter cover description (for protocol see appendix 4)
- 7<sup>th</sup> November: Data collection (macrofauna) in a national protected forest area and travel back to Bangkok
- 10<sup>th</sup> -11<sup>th</sup> November: Lamina baits and humus data analysis in KU
- 12<sup>th</sup> November: identification of soil macrofauna
- 13-14<sup>th</sup> of November: data analysis
  - 13<sup>th</sup> November: Data organization for statistics (contingency table, pivot table)
  - 14<sup>th</sup> November morning : multivariate analysis
  - 14<sup>th</sup> November end of morning : Open lecture by Prof Thibaud Decaens on “How to monitor soil fauna diversity using barcoding technology”



- 14 November: common meal and end of the training



## **Main output**

### *In terms of soil fauna survey and activities*

- Setting up of an experimental design (block assay with intra and inter repetition)
- Setting up of a soil fauna survey (where to put the plot, number of plot repetitions)
- How to collect soil fauna using TSBF technique (see appendix 3)
- How to analyse the soil OM layer using the Humus index method (see appendix 4)
- To use lamina bets technology to monitor OM degradation (see appendix 2)

### *In terms of data analysis they know now*

- How to organize data tables
- How to set a contingency table
- How to use excel and the pivot table to plot data, calculate means and standard deviations
- How to use (for some of them) Xlstat to do multivariate analysis

### *Evaluation comments and auto-analyse (appendix 1)*

All the objectives and goals were achieved and we got a complete set of data, which can now be valorised (we schedule 2 papers). But the result of the evaluation (see appendix 1) shows that the training did not reach the level of expectations of some participants. For the next training session, we certainly need to:

- (i) Be clearer about the objectives and agenda. As it was the first time we organized such a training, it was not obvious to determine for each analysis the time required
- (ii) To give the documents (methodological papers, protocols, lectures) in advance before the training
- (iii) To develop further the activities devoted to data analyses and statistics

However, all the trainees at the end of the training got the following knowledge:

#### In terms of sampling strategy in the field

- What is an experimental design (block assay with intra and inter repetition).
- How to design a soil survey (where to put the plot, number of plot repetition).
- How to collect soil fauna using TSBF technique.
- How to analyse the soil OM layer using the Humus index method.
- How to use lamina bets technology to monitor OM degradation.

#### In terms of data analysis

- How to organize their data,
- To set a contingency table,
- To use excel and the pivot table to plot their data, calculate mean and standard deviation,
- To use (for some of them) a statistical software to do multivariate analysis



**Auto-analysis: the strength and assess of the learning by doing approach**

For some of the candidates, this “learning by doing” approach was new, as most of the trainees are used to a more classical approach (first theory with lectures and secondly field demonstration). The learning by doing approach is more related to the real life of a researcher; *theory must originate from questions arising from field works*. We do not want demonstration on a blackboard, we want each student to get is own data, acquired the skill to analysed it and to ask questions related to is field works to the trainers. This was our goal, and this training was successful in that term.

