International Joint laboratory (IJL)

Laboratoire Mixte International (LMI

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

Short report of Year 2012

LMI LUSES Background

Specification

Entitled LUSES for « Dynamic of Land Use changes and Soil Ecosystem Services », the international joint laboratory is an initiative of the "Institut de Recherche pour le Développement" (IRD – Research Institute for Development), which associates French and South-East Asian partners from various universities and research institutes.

An international joint laboratory (LMI – Laboratoire Mixte International) is an operational structure dedicated to research and to trainings, contributing to the implementation of projects around a scientific platform. This platform has a regional and international dimension: seven Asian partners, from Laos, Thailand and Vietnam are associated to this project with French researchers.

Goals

This project aims to consolidate local skills related to the preservation of environmental and ecological soil functions.

General Goal

The success of the bilateral collaborative research programs between IRD and the research institutes and universities in Thailand, Viet-Nam, and Laos, within each country, allows a step forward, i.e. building a multilateral partnership at regional scale. The general objective of LUSES is therefore to create and then consolidate a regional program in agronomic and environmental/ecological sciences. This will be accomplished through:

- Developing multidisciplinary researches:
  - Build upon already existing competences, instruments and experimental fields in order to create a trans-country pool of experts;
  - Respond to national and regional development needs/
- Capacity building :
  - Teaching of University level courses (Master, etc..)
  - Research training at the tertiary level (BSc, MSc, PhD, ..)
  - Training of researchers and technical staff during short thematic schools (thematic training course, etc.)

Scientific Goal

The study area (Vietnam - Laos - Thailand) contains contrasting situations in terms of agricultural systems and environmental issues but these countries also have in common to present fast and hardly predictable changes in land use. The LMI will promote synergies between the partners in order to implement international research programs on the impact on soil ecosystem services of the intensive agriculture practices, in relation to the land use changes.

To achieve this objective, the project LMI LUSES is organized in 4 Work Programs (WP, see details in the kick off meeting report). These WP are related to ecosystem services (WP1: nutrient cycling, WP2: biodiversity, WP3 C sequestration and WP4 the water cycle and erosion). Each WP is led by an Asian and a French institution that are members of the project (see Table 1).

	WP1: Soil fertility and the dynamics of mineral nutrients	**WP2:** Soil and water functional biodiversity	**WP3:** Carbon storage in plant biomass and soil	**WP4**: Regulation of water flow and erosion
ASE Leader	**Tran Duc Toan**	**Yupa Hanboonsong**	**Poonpipope Kasemsap**	**Oloth Sengtahevanghoung**
	SFRI Vietnam	**KKU Thailand**	**KU Thailand**	**NAFRI Laos**
Co-leader	Wanpen Wiriyakitnate	Ngo Quoc Anh	Sathaporn Jaiarree	Trinh Anh Duc
	LDD Thailand	ICH Vietnam	LDD Thailand	ICH Vietnam
France Leader	**Henri Robain**	**Didier Lesueur**	**Alain Pierret**	**Olivier Ribolzi**
	Bioemco	**Eco&Sols**	**Bioemco**	**GET**
Co-leader	Claude Hammecker	Emma Rochelle	Fréderic Gay	Didier Orange
	Eco&Sols	Bioemco	Eco&Sols	Bioemco

Partnership

The strength of the LMI LUSES is rooted in its international scale: Involving three South-East Asian countries (Laos, Thailand, Vietnam) and France, this LMI aims to have a regional influence. LUSES includes seven major Asian institutions (listed below) and the main French research units (UMR) on soil ecology . In terms of regional dynamic, LUSES is also a key component of Regional Pilot program SELTAR (Soils, Waters, Coastal Zones and Societies in Southern and Southeast Asia).

Name	Countries	Institutions	Keyword	Coordinator
UMR BIOEMCO	France, Paris	CNRS, ENS, INRA, IRD, AgroParisTech UPEC, UPMC	Environmental sciences, Soil Science, Functional Ecology, Water resources	C. Valentin(d.a.u.IRD)
UMR ECO&SOLS	France Montpellier	CIRAD,INRA, IRD, SUPAGRO	Soil Science, Functional Ecology, Biogeochemical cycles in agrosystems	JL Chotte (d.u. IRD)
UMR GET	France, Toulouse	CNRS, UPS, IRD, CNES	Environmental sciences, Soil Sciences, geochemical cycles, water resources	JJ. Braun (d.a.u. IRD)
ARCL[1]	Lao P.D.R.	NAFRI	Agriculture and forestry research activities	Mr Oloth Sengtaheuanghoung
Faculty of Agriculture	Lao P.D.R.	NuOL[2]	Agriculture Science	Dr. Silinthone Sacklokham,
Soil & Biotech Office	Thailand	LDD[3]	Soil Sciences, Soil biodiversity, agriculture	Mr. Chalong Tepwituksakit.
Faculty of Agriculture	Thailand	Khon Kaen University (KKU)	Soil Biodiversity, Soil fauna,	Prof. Dr Sumon Sakulchai,
Faculty of Agriculture	Thailand	Kasetsart University (KU),	Ecophysiology, tree plantation, C seq,	Prof. Sornprach Thanisawanyangkura
SFRI	Vietnam	VAAS[4]	Environmental sciences Soil sciences, impact of fertilizers	Dr. Ho Quang Duc
Institute of Chemistry	Vietnam	VAST[5]	Water organic matter, soil and water pollution	Prof. Dr. Nguyen Van Tuyen

1 The Agricultural Land Research Centre
2 The Faculty of Agriculture of the National University of Laos
3 Land Development Department
4 Vietnamese Academy for Agriculture Science
5 Vietnamese Academy for Science and Technology

LUSES organization

Coordinators

The coordinators of LUSES are Mr. Alain Brauman, Director of Research at IRD posted at the Land Development Department since the 1st of September 2011 and Mrs. Nopmanee Suvannang in charge of the « Office of Soil Science for Land Development » at the LDD.

Scientific Committee

Role: The scientific committee shall be responsible for defining LUSES's scientific programs and shall be consulted for all matters relating to the means, organization and functioning of new partnership. Scientific experts, suggested by the coordinators of the Laboratory can be appointed jointly by the Parties.

Composition: The Scientific Committee is composed of:

- the eight leaders of the work packages (four Asians + four French)
- the coordinator and co-coordinator of LUSES.

The Steering Committee

Role: The Steering Committee shall vote on budget allocations, approve scientific orientations, by the Scientific Committee. Furthermore, it shall verify the alignment between these orientations, trainings and teaching programs. The Steering Committee shall meet on an annual basis.
Composition year 2012 The Steering Committee shall be composed of a member from each partner institution of the countries concerned and the Directors of the joint research units involved in LUSES or their representatives.

Name	Institute[6]	Country	Title	Status
Jean Jacques Braun	UMR GET	France	Representative of UMR GET	Core member
Noel Buathong	NuOL	Lao P.D.R.	Head of Dept of Plant Science	President
Jean Luc Chotte	UMR ECO&SOLS	France	Head of UMR ECO&SOL	Core member
Yupa Hanboonsong	KKU	Thailand	Director of Office of International Agriculture	General Secretary
Régine Lefait Robin	IRD	France	IRD Regional representative	Core member
Pitayakorn Limtong	LDD	Thailand	Director of the office of expert	Core member
Jean-Charles Maillard	CIRAD	France	CIRAD Regional Director	Core member
Oloth Sengtahevanghoung	NAFRI	Laos	Deputy Director of ALURC	Core member
Sornprac Thanisawanyangkura*[7]	KU	Thailand	Vice president of KU for Research	Core member
Tran Duc Toan	SFRI	Vietnam	Deputy Director of SFRI	Core member
Christian Valentin	UMR BIOEMCO	France	Deputy Director of UMR	Core member
Nguyen Van Tuyen	ICH-VAST	Vietnam	Director of ICH	Core member
Alain Brauman	IRD	France	Coordinator of the LMI LUSES	Invited
Moncef Medebb	SCAC	France	Attaché for Scient. and Higher Education Coop.	Invited
Nopmanee Suvannang	LDD	Thailand	Co-Coordinator of the LMI LUSES	Invited

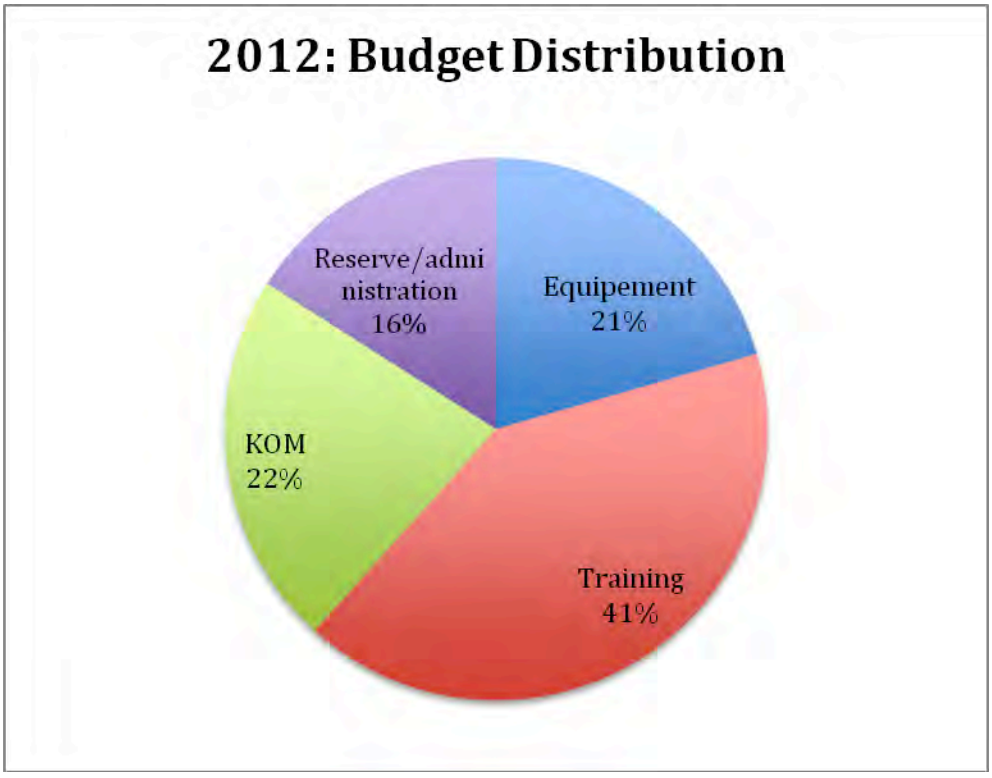
[6] See apendix 1 for Institute glossary

[7] Excused and represented by Dr. Poonpipope Kasemsap, Vice president for International Affair

Budget 2012

The budget allocated to LUSES in June 2012 was 38,000 € euro (see table below). 64% was devoted to capacity building and exploratory projects, 22 % to organizing the Kick off meeting (KOM) and 14% to administration expenses (mainly on the salary of the secretary).

	IRD LMI LUSES	Co-funding	Institutions
Kick off meeting	8500	1500	SELTAR (IRD)
		3956	UMR ECO&SOLS
		8000	UMR BIOEMCO
Exploratory projects	4606	600	HRPP
		1300	UMR ECO&SOLS
		700	Univ. Supagro
Capacity building			
Equipment	8540	11000	ECO&SOLS
Training	8540	2400	PPR SELTAR
		10000	Kasetsart Univ.
Congress	2502		
Administration			
Secretary Luses	3726		
Running cost	1586		
Total	**38000**	**39456**	**51% of co-funding 14% partners**



2012 main events

1-2012 Agenda

1 June: launching of Luses and of its first Internal call proposal.

9 July: deadline for the submission of proposal forms.

23 July: steering committee final decision to elect 9 proposals.

1 August: handing over of the budget to the selected proposals

10-13 October: first collective training of Luses (Vientiane, Laos) / introduction to the R environment.

18 -19 October: Luses kick off meeting (KOM).

20 October: 1st meeting of the Steering committee.

15 November: decision of LDD to assign a specific room for the installation of the future co shared LMI-LDD laboratory of soil microbiology.

26 -30 November: collective Training of LDD staff on Near Infrared spectroscopy

15 December: launching of the 2nd internal call for 2013

2- Kick of meeting LUSES

2-1-Organization

The kick off meeting has been held in Bangkok from 18th to 20th of October (see program in annex 1). It has gathered all the partners, i.e. 60 participants). LUSES is important because it is the first IRD's mix laboratory to have a regional dimension. More than 7 Universities, research institutes, public agencies from Laos, Vietnam and Thailand are associated. The morning session of the first day was devoted to partners 'presentation and description of the resources allocated to the laboratory. Round tables were organized on 4 Working package, each linked to a specific ecosystem service (nutrient cycling, biological diversity, C sequestration, water cycle and erosion). Priorities in terms of capacity building (training and equipment) and project organization were debated during the last day.

2.2- Main output

1. Validation of the structuration of the project in WP. Each WP confirms the objectives, key words and deliverables.
2. Better specification of the scientific project:
   Land uses will concerns in priorities the transition form annual crop to perennial one (and reverse).
   Plants models Acacia mangium in Vietnam, Teak in Laos, Rubber in Thailand
3. Determination of the main priorities for the next 3 years in term of training, equipment and building capacities.

2.3 - Remains to be done

- A better integration of the 4WP around common project.
- The LUSES project represents a good context to tackle and promote a multi-scale approaches (from the soil aggregates to the field scale).
- Promote project at a regional scale. These has been done in 2012 through the submission of different project including 3 ANR projects (i.e. French National Research Agency)

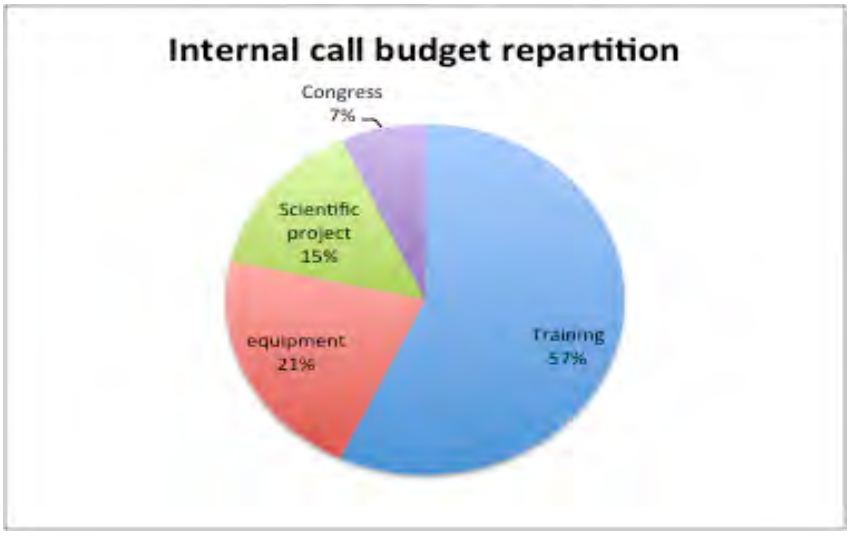
LMI LUSES Internal Call 2012

The 2012 internal call was launched in June 2012 (when the LMI budget was received) for a total budget of 24.000 €. 12 projects were received and 9 (listed in the Table below) were selected by the scientific committee of LUSES. A short report of each project is provided in appendix 2. 4 projects were cofounded for a total amount of 16700 € (41% of the total amount) mainly by French institutions like IRD and CIRAD but also by local institutes like University of Kasetsart. This cofounding feature will be one of the priorities of the next call, which has been launched in December.

List of internal call funded

Leader	Country	Type of support	Partners	Amount (€)	Co-funding
IRD Vietnam JL Janeau	ALL (vietnam)	Equipment	LDD SFRI KU, NAFRI	4200	
CIRAD	Thailand	Symposium (3 participants)	LDD and KKU	2800	
IRD Laos A. Pierret	ALL (Laos)	Collective Training	All	2400	2500 (PPR SELTAR)
SFRI Toan Tran Duc	Vietnam	Indiv. training	SFRI	2550	
LDD M. Perawatchara	Thailand	Exploratory Research project	LDD, KU, KKU	3000	3000 (ECO&SOLS)
KU Student (Kaka)	Thailand	Individual application	Kasetsart University	1600	1295 (CIRAD & Supagro)
LDD N. SUVANNANG	Thailand	Collective training on NIRS	LDD and KU	3000	
KKU P. Kasemsap	Thailand	Equipment and training	KU	2000	10000 (Univ Kaset)
IRD A.L. Pablo	Thailand	Lab Equipment	LDD	2600	
			Total	24150	16795

The internal call budget repartition (see figure below) fit with the priorities of the LMI project as the majority (~60%) of the proposal funded concerns training projects.



Setting of a LMI molecular platform within the LDD

One of the objectives of LUSES is to strengthen the capacity buildings of the Asian partners in soil analysis by the setting up of modern analytical platform. The overall objective is to set a **"soil laboratory without wall"** between the different Asian partners of the project (Soil physical and microbial analysis in LDD, soil organic matter in SFRI and ICH, soil macrofauna in KKU, roots physiology in Nafri etc.).

Within this objective, and with our partner of the Biotech department of the LDD and CIRAD (D. Lesueur) we begin in 2012 to set up a microbial molecular platform to study the soil microbial compartment with the following contributions. This platform has been set up with equipment's provided by different institutes (see list below) and the laboratory will be hopefully functional in February Marsh 2013.

Year	Institutes	Amount	Description
2011	IRD	25000	Molecular equipment
	ECO&SOLS	4000	Small lab equipment
	CIRAD	11000	Microbial equipment
2012	ECO&SOLS	11000	Molecular equipment
	LDD	18000	Molecular and small lab equipment
	LMI LUSES	2600	Small lab equipment

The Microbial Platform

Perspectives 2013

A- Increase the level of submission to international call

- An IFC project (French Institute of Rubber) on Rubber plantation impact on Biodiversity and C sequestration has been just accepted.
- Luses members are involved in the current submission of 3 ANR projects (2 "ANR Blanc" and one "Agrobiosphere").
- A project of young research team (JEAI) on ecosystem services provided by rubber plantation will be submitted to IRD involving national University of Laos and University of Khon Kaen.
- A project has been submitted to AUF involving Laos and Thailand on tree plantation soil diversity.

B- Improved the capacity building production of Luses partners

This important objective will be done using regional collective training (which need to be first selected by the scientific committee) as a main tool for increasing local capacities building. Some examples of proposal of collective training are given below (this list is not exhaustive)

- A training intitule “How to write a scientific paper “ will be organized in Khon Kaen with the scientific and financial contribution of the University of Khon Kaen
- The training on the software R for data organization and statistical analysis held in Vientiane in 2012 will be followed by a second session also held in Vientiane. This training will be organized with the cooperation of Nafri and NuOl University;
- A field training on the “Use of artificial rainfall in research project” will be organized by the IRD team of Vietnam in March 2013 with Lao and Thai partners (according of the budget founded) ;
- A proposal of Master Class on the microbial assessment of bio-fertilizers has been submitted by Dr Lambert Brau of Deakin University (Melbourne) to Crawford Foundation in Australia. Dr Didier Lesueur (CIRAD, Eco&Sols Thailand) will submit a proposal to LMI LUSES and PPR SELTAR for getting some co-funding for this Master Class.

ANNEX I: LMI Kick-Off meeting program

Dynamic of Land Use changes and Soil Ecosystem Services

October 18th to 20th, 2012

Land Development Department, LDD meeting room, 8th floor, Bangkok, Thailand

PRELIMINARY AGENDA

18 of October, at the Land Development Department

PLENARY SESSION

8:00-9:00: Registration

9:00 to 09:30: Opening Ceremony

09:30 –10;30: **LMI LUSES Introduction**

09:30-09:45: LMI: a joint project in partnership
by IRD representative

09:50-10h35: Introduction to the LMI LUSES
by Nopmanee Suvannang (LDD): Co-coordinator of LMI LUSES
and Alain Brauman (IRD): Coordinator of LMI LUSES

10:35-11:00: Coffee break

11:00-12:30: **Presentation of the Institution involved**

11:00-11:10: SFRI (Vietnam)
by Toan Tran Duc (SFRI): Deputy Director

11:15-11:25: ICH (Vietnam)
by Van Tuyen Nguyen (ICH): Director

11:30-11:40: NAFRI (Laos)
by Oloth Sengtahevanghoun (NAFRI): Deputy Director

11:45-11:50: NuoL (Laos)
by Somphanh Pasouvang (NuOl): Vice Dean of Research

11:55-12:05: Khon Kaen University (Thailand)
by Yupa Hanboonsong (KKU): Dir. of office of Inter. Agriculture

12:10-12:20: LDD (Thailand)
by LDD representative

18 of October, at the Land Development Department

12:30-13:30: Lunch break

13:30-14:30: Visit of LDD facilities

PLENARY SESSION (presentation of the institutions involved)

14:30-14:40: Kasetsart University (Thailand)
by Poonpipope Kasemsap (KU): Vice president for Inter. Affairs

14:45-14:55: IRD (France)
by Régine Lefait-Robin (IRD): Regional Coordinator

15:00-15:10: CIRAD (France)
by Jean Charles Maillard (CIRAD): Regional Director

15:15-15:25: UMR BIOEMCO (France)
by Christian Valentin (IRD): Deputy head of BIOEMCO

15:30-15:40: UMR ECO&SOLS (France)
by Jean Luc Chotte (IRD): Head of ECO&SOL

15:45 -16:15: Coffee break

PARALLEL SESSIONS

16:15 – 17:30: **LMI LUSES the scientific project**

4 concurrent sessions corresponding to the 4 working packages

- Nutrient Cycling
- Biological Diversity
- C Sequestration
- Water Cycle and Erosion

18:30 **Dinner at the Maruay Garden Hotel**

12:00-13:00: Lunch break at Maruay Hotel

19th of October, at the Land Development Department

PARALLEL SESSIONS

8:00-9:00: 4 working packages session 2nd part

PLENARY SESSION

9:00-10:30: Presentation of workshop outputs

10:30-10:45: Coffee break

10:45–12:00: LMI and regional aspects

10:45-11:00: Regional Pilot Program SELTAR
by Christian Valentin (IRD): head of PPR SELTAR

11:05-11:20: MSEC : Management of Soil Erosion Consortium
by Oloth Sengtahevanghoung (NAFRI) : head of MSEC

11:25-11:40: Presentation of LMI IFCWS
By Jean Jacque Braun (IRD): head of IFCWS

11:45-12:00: Presentation of HRPP
By Fred Gay (CIRAD): HRPP Coordinator
(Hevea Research Platform in Partnership)

12:00-13:00: Lunch break

PARALLEL SESSIONS

13h00 -15:00 : LMI LUSES, Education and Capacity building

3 concurrent sessions

- Training (collective and individual)
- Organization – communication
- Capacity buildings (field and laboratories)

15:00-16:00: workshops outputs

16:00-16:30: Coffee break

16:30 -17:30: General discussion and Conclusion

20th of October, at the Maruay Hotel

10:00-12:00: Steering Committee (members only)

ANNEX II

INTERNAL CALL PROJECT REPORT 2012

TABLE OF CONTENTS

I. Photographic method to estimate Leaf Area Index in tree plantations

Project Leader	**Poonpipope Kasemsap**

LMI partners (French)*	
Frederic Gay	CIRAD, UMR Eco&Sols

Objective of the proposal

Several methods can be applied to measure LAI in tree stands. Photographic methods are among the most used thanks to the availability of high resolution digital camera at affordable price and the development of image processing software.
This proposal has two objectives:

- Purchase a digital camera+fish-eye lens+ support arm for the LMI that could be used in LAI or modeling studies
- Set-up a 2-3 day training course on LAI measurements for the LMI partners.

Achievements of the project / Problems encountered

- The fish-eye system has been purchased and is being tested by the team from Kasetsart University involved in this project.
- The training course was planned in October but was cancelled due to lack of participants. Too many LMI LUSES's events or other events involving some partners of the LMI were scheduled at this time: Training on R-software in Laos, kick-off meeting of the LMI, Scientific Seminar of the Hevea Research Platform in Partnership organized by the CIRAD's team in this project. Then, despite high interest for this training course, potential participants were not available to attend it. According to KU and CIRAD's team schedule, the training would be organized in February 2013.

Main output of the project

- The main output of this project should be the training of some LMI partners to methods to measure LAI in tree plantations. It is expected then that it will arouse the interest of LMI partners for research work on tree physiology in addition to the works on soil they are carried out already.

Perspective

- Development of collaboration on tree physiology among partners of the LMI.
- Organization of a training course on ecophysiology in 2013 under the patronage of LMI LUSES and the HRPP.

Budget

Amount requested		2000€
Amount granted by LMI		2000€
Total expenditures		*2012€**
- Nikon camera + Sigma fish-eye lens	54 548 THB	*1380€**
- Support system (tripod+frame)	25 000 THB	*632€**

*Approximate amount calculated with a change rate of 39.5 Bath/€

II. Changes in soil organic carbon and biological diversity across a chronosequence of rubber plantation

Project Leader	**Monrawee Peerawat LDD (Soil microbiology)**

LMI partners (French)*	Fred Gay (Soil resp) – Alain Brauman (microbial compartment) Henri Robain (physical compartment)

Others Partners	
Western Countries	Johnny Boyer CIRAD (Soil Fauna) Marin Lafaye (French Students)
Asian Countries	Chutinan Choosai KKU and Phakphoom Tanttachasatid (KU soil fauna)

Type of project	**Corresponding expenses**	**Amount (€)**
Individual application	Allowance /lab or field fees/training /travel etc.	
Exploratory Research project	Mission/ research fees/field expenses/ others	1500
Scientific Equipment (> 1500 €)	field supplies / Lab. supplies / equipment	1500
Scientific Congress, Lectures,		
Thematic school		
Others		

Asian Countries involved (name of the institutions)

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	X	X	

Objective of the proposal

Context

Thailand faces a rapid and uncontrolled expansion of rubber plantation du to the increasing demand of natural rubber. Rubber tree development has been booming for the past two decades and has affected and impacted soil ecosystem services like biodiversity, soil fertility and water resources. Despite the economic and ecological importance of rubber tree in this

area, the environmental impact of this plantation on soil ecosystem services like soil biodiversity, nutrient cycling or C sequestration remains to be addressed.

Question of the project: what is the long-term impact of rubber tree on soil functionning
Objective

General: Determine the impact of long term Rubber tree plantation on soil functional biodiversity
Specific:
For the macrofauna: determine the impact of rubber tree plantation on the soil engineer (soil macrofauna) structure.
For the microbial compartment: Compare the biological activity (soil respiration), density and structure along a chronosequence of Rubber tree plantation

Achievements of the project / Problems encountered

Localization: All the measurements has been done in the area of Sanam Chaiket nearby the Chachoengsao Rubber Research Center (CRRC)

- 5 sites were chosen: Control (Cassava field) / 1-3 years Rubbers plantations/5-7y/9-11y/>15y

Analysis Done

- Soil respiration, soil fauna survey, soil sampling for NIRS, soil sampling for microbial measurements
- Soil fauna identification (done in December in Khon Kaen University)
- Soil physical measurements (NIRS) and soil variability (resistivity measurements)

Pending

- Soil microbial characterization (scheduled in 2013 at Montpellier Eco&Sols)
- Analyses of NIRS spectra with KU University

Main output of the project

- Characterize the dynamic impact of rubber tree planation on soil biodiversity and activities (soil respiration) associated
- Determine if the biological diversity could be a good proxy of soils physical evolution under Rubber tree
- Development of a local network (LDD-KU-KKU) around this thematic

Perspective

- Analyses of the soil microbial component during the training of Mrs Monrawee Peerawat from LDD from January to may in the UMR ECO&SOLS (IRD BEST grant)
- 3 project around this thematic will be submitted to:

1- French ANR Agrobiosphere)
2- Rubber French Institute (IFC)
3- IRD (Young research team)

Budget

Amount requested		5000
Amount granted by LMI		3000
Total expenditures		3000

*Approximate amount calculated with a change rate of 39.5 Bath/€

III. Infrared spectrometry to estimate C sequestration in soil under rubber plantations in Thailand

Project Leader	Frederic Gay

LMI partners (French)*	
Didier Brunet	IRD, UMR Eco&Sols
Philippe Thaler	CIRAD, UMR Eco&Sols

LMI partners (Asian)*	
Poonpipope Kasemsap	Kasetsart University, Thailand
Suthisak Saengtharatip	Kasetsart University, Thailand

Objective of the proposal

Assessing the evolution of soil organic carbon content (SOC) with plantation age requires a large number of soil analyses. The classical chemical methodology is tedious, time-consuming and expensive. Conversely, the infrared spectrometry methods are faster, cheaper and easier to implement on large samples.
However, these methodologies have never been used so far in soils of rubber plantations in Thailand and require adapting the statistical methods to soils of rubber plantations. The objective of the proposal is to develop specific statistical models to predict SOC in soils of rubber plantations from infrared spectrometric measurements. The methodology will be applied to follow the evolution of SOC in a chronosequence of rubber plantation in eastern Thailand (Chachoengsao province).

Achievements of the project / Problems encountered

- 981 samples of soil from 15 rubber plantations of age between 7 to 25 years old and 4 cassava fields were collected in Chachoengsao province.
- 250 samples were used to develop calibration models between NIR spectrum and CHN analysis for the two NIRS system used at UMR Eco&Sols: a laboratory device (Foss NIRSystem 6500) and a portable VIS-NIRS device (xxxx).
- Calculation of stock of organic carbon in the soils of the plots where the samples were taken is under process. This calculation will give the SOC by layers of soil (0-5, 5-10, 10-20, 20-30, 30-40, 40-60, 60-80, 80-100) and for the whole profile as well.

Main output of the project

- Calibration of 2 NIRS devices for the determination of SOC in soils of rubber plantation in Thailand.
- Assessment of the change of SOC in rubber plantations with the age of the plantation and in comparison with the previous land use.

Perspective

- Development of the application of the portable VIS-NIRS system in studies on carbon sequestration in the soils under rubber plantations in Thailand in partnership with LDD.
- PhD thesis of the master student who undertake this work (topic currently under discussion).
- One publication in an international journal from this work.

Budget

Amount requested	2490€
Amount granted by LMI	1490€
Total expenditures	1606€
- CHN analysis for 250 samples	*1606€*

Expenditures were higher than the budget granted due to underestimation of the unit price of the analysis. The increase was accepted by LMI coordinator. Co-funding came from UMR Eco&Sols internal budget.

IV. Small complementary equipment for the LMI molecular platform

Project Leader	Anne Laure Pablo (future technical assistant of the LDD LMI platform)

LMI partners (French)*	Didier Lesueur et Alain Brauman UMRECO&SOLS

Others Partners	
Western Countries	
Asian Countries	LDD Dept of Soil research

Type of project	**Corresponding expenses**	**Amount (€)**
Individual application	Allowance /lab or field fees/training /travel etc.	
Exploratory Research project	Mission/ research fees/field expenses/ others	
Scientific Equipment (> 1500 €)	field supplies / Lab. supplies / equipment	2600

Asian Countries involved (name of the institutions)

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		

Objective of the proposal

Strengthening the capacity building of the partners, which constitutes one of the goals of the LMI LUSES, is linked to the development of local analytic platforms in order to set up a network of soil facilities at the regional scale. Such improvement will be obtained first through the reinforcement of the laboratory equipment in the different technical platforms. The current microbial platform of the LDD lacks small equipment needed to be fully operational. Anne Laure Pablo, who lead the microbial molecular platform in Montpellier of ECO&SOLS scheduled a short training course of 15 days in order to set up the LDD lab with the new equipment and begin to train the LDD technical staff on soil DNA extraction procedures and PCR-DGGE. Therefore, this application aims to buy the small supplies needed for this training session

Achievements of the project / Problems encountered

The equipment has been moved to the new laboratory (see picture in the CR LUSES)
The small equipment (glassware, chemical, lab consumables) has been purchased with this proposal and install.
The LDD partner build new lab bench covered with glass and new storage cabinet

Mission of Anne Laure : For reason link to the management of the molecular Platform of ECO&SOLS at Montpellier, Anne Laure Pablo, who is in charge of this platform was not able to give this training course.

Main output of the project

Thank's to this budget, we were able to nearly complement most of the consumables needed to start in 2013 this future platform.

Perspective

- We submitted to IRD a demand for an I.V. International volunteer) to take in charge all the quality control and the management of the laboratory.
- A French student will begin to set up the quality control of the Lab during a 3 month training

Budget

Amount requested		4600
Amount granted by LMI		2600
Total expenditures		*2600*

*Approximate amount calculated with a change rate of 39.5 Bath/€

Budget
Lab consumables : 600 €
Molecular products : 1300
Glassware : 500 €

V. Statistical Analysis for ecological modeling

Project Leader	Tran Sy Hai (SFRI), Vietnam

LMI partners (French)*	Didier Orange (UMR BIOEMCO)

Others Partners	
Western Countries	Dominique Laffly (UMR GEODE, University of Toulouse)
Asian Countries	

Type of project	Corresponding expenses	Amount (€)
Individual application	Travel Hanoi-Paris-Toulouse and back *Per diem* and accommodation 15 X 90€	1200€ 1350€
	TOTAL	2550€

Asian Countries involved (name of the institutions)

Thailand	Vietnam	Laos	Others
	X		**FRANCE**

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

Objective of the proposal

To complete the knowledge of MSc. Tran Sy Hai in Statistical Analysis for ecological modeling in regards of grant application for PhD in 2013, about water contamination by agricultural inputs along the hillslope.

The training will be organized based on:
- Correspondence Factor Analyzes (AFC) and Multiple Correspondence Factor Analysis (MCA). These methods are suitable for the analysis of qualitative data which constitute the bulk of environmental data base outcome of investigations in the field. Quantitative data are discretized before being integrated into an overall analysis is usually performed on a multiple contingency matrix (Burt table, MCA) or on a matrix of type-complete disjunctive (presence-absence). We obtain therefore a factor space representing simultaneously - in contrast to principal component methods - individuals and variables. This space summarizes the strong structures of the organization of data structures that are interpreted retrospectively. In addition, factorial methods used to introduce variables and / or additional individuals, which can be a very interesting simulation solution.
- The Ascending Hierarchical Classification (AHC). It is particularly well suited to the analysis of proximities in the factorial space that meets the dual representation of data (distributional equity).

- The Bayesian Probability Models. They can ultimately be used to calculate the probabilities of occurrence of an event from the class profiles. Each class after the AHC is made up of individuals and therefore a profile frequency of occurrence of each variable. These profiles are used to compile tables of probabilities according to Bayes' rule of probabilities known causes - with continuous quantitative data, it is called maximum likelihood.

By the merging of these statistical methods, we can therefore consider coupling between environmental descriptors interesting landscapes and field surveys for, knowing the type of landscape of a given site, infer the likelihood of occurrence of such and such socio-spatial practices from surveys, and vice versa.

Achievements of the project / Problems encountered

One of the main statistical development challenges facing developing countries in which Vietnam is not an exception that is lack of appropriate human resources and up-to-date skills. One of the major solutions for this problem is formally establish Statistic Training and Human Resources. There are a number of challenges in doing all these including building statistic skills, empowering data producers, empowering data users with technical and other skills. The achievement of this LMI-LUSES Project is first step to support a training course on statistical for ecological modeling.

Main output of the project

- Data analysis: Univariate analysis and Bivariate analysis
- Data processing from raw data into description statistic
- Using a modeling (Philcarto software version 5.5) to mapping of data in the statistical data file

Perspective

Due to this training on statistical spatial analysis, MSc. Tran Sy Hai could be the resource person to study potential environmental impacts through GIS tools within the LMI LUSES and for the MSEC network. Indeed, the MSEC data base is completed with very different variables, from the environment descriptors to socio-economic indicators. The statistical data mining of this kind of matrix could be conducted by Mr Hai thanks to the skill learned with Prof. Dominique Laffly in Toulouse. Then it would be an opportunity for Mr Hai to join a PhD programme.

Budget

Amount requested	2550€	
Amount granted by LMI	2550€	
Total expenditures		

*Approximate amount calculated with a change rate of 39.5 Bath/€

VI. Participation to the 2nd Asian Conference on Plant-Microbe Symbiosis and Nitrogen Fixation

Project Leader	Didier LESUEUR

LMI partners	Dr Chavevaan Leaungvutiviroj, LDD Thailand
	Dr Kiriya Sungthongwises, KKU Thailand

Others Partners	
Western Countries	
Asian Countries	

Objective of proposal

An application was submitted in the frame of the internal call of LUSES in 2012 asking for a financial support in order for 3 members of the LMI to attend the 2nd Asian Conference on Plant-Microbe Symbiosis and Nitrogen Fixation in Phuket in October 2012. Dr Chavevaan Leaungvutiviroj of Land Development Department (LDD), Dr Kiriya Sungthongwises of Khan Kaen University (KKU) and Dr Didier Lesueur of Eco&Sols attended such conference.

Main output of the project/conference

It was an important meeting to attend for several reasons:

A. Many Asian research teams working on bio fertilizers were present and it was very much important to meet them and to establish a contact for further collaborations.
B. The scientific level of the presentations and posters was pretty good and relevant knowledge on the academic point of view but also in terms of application was shared.
C. The SUT's demonstrated a high level of professionalism during the whole conference and it will be important to develop more collaborations with them on bio fertilisers: they have very good scientists such as Dr Panlada Tittabutr and Dr Neung Teaumroong and the presentations made by their students were very impressive.
D. The creation of the Asian network leaded by Deakin University (Dr Lambert Brau) was fully approved by the whole participants to the satellite workshop and the idea is to take it off as soon as possible. Some ideas have been already discussed for the upcoming years.
E. In Thailand several groups and research teams have been working on bio fertilisers for many years but we noticed the absence of coordination between such teams. The idea to come up with common project involving some of those teams may facilitate the exchanges and optimize the system rather repeating that has been done by other teams. LUSES may play a key role on that as LDD and KKU are amongst the key Thai's partners working on bio fertilisers in Thailand with SUT and DOA.

Description of the project / Problems encountered

About 120 participants attended the 2nd Asian Conference on Plant-Microbe Symbiosis and Nitrogen Fixation in Phuket (Thailand). The previous one was 2 years ago in Japan (Miyazaki) organised by the Prof Kiwamu Minamisawa of Tohoku University. The present conference was organised by the Suranaree University of Technology (SUT) with Dr Neung Teaumroong chairing the Committee of Organization. We had participants coming from South East Asia such as Malaysia, Indonesia, Myanmar and Cambodia (no one from Laos), from India, from Japan (strong delegation), from Australia (important delegation coming from Murdoch University - Perth but also Deakin University - Melbourne and University of New England - Armidale) and of course from Thailand (Universities such as KKU, Kasetsart University, Chiang Mai University but also governmental Institutes such as LDD and Department of Agriculture - DOA).

Basically 2 posters were presented and one oral presentation was made

A. **Dr Chavevaan Leaungvutiviroj** presented a poster entitled "Bio fertiliser LDD 12 for increasing soil fertility and agricultural productivity" co-signed with P Ruangphisarn and P Hansanimitkul of LDD.
B. **Dr Kiriya Sungthongwises** presented a poster entitled "Abilities of native phosphate solubilizing bacteria isolated from the rhizosphere of economical crop in North East Thailand to solubilise insoluble phosphates under in vitro conditions" co-signed with C Boonthai Iwai and A. Wongcharoen of KK, A. Brauman and D Lesueur of Eco&Sols.

C. **Dr Didier Lesueur made an oral presentation** as invited speaker entitled "Microbial inoculants to increase in the field biological nitrogen fixation and nutrient use efficiency of legumes" co-signed with Ms Laetitia Herrmann and Dr Lambert Brau of Deakin University, Dr Rosalind Deaker of Sydney University and Dr Jan Jansa of Institute of Microbiology in Praha.

In addition of his presentation, Dr Didier Lesueur has co-chaired with Dr Natthiya Buensanteai (SUT) one session specifically dedicated to "Young Scientists".

Satellite Workshop on an Asian Network on bio fertilisers

At the end of the Conference, a satellite workshop was organised by a consortium of several Australian Universities (Deakin, Murdoch and Sydney) and also Eco&sols. The idea was to suggest the creation of a new network on the utilization of bio fertilisers in Asian agricultural systems. About 50 to 60 people attended it. Dr Lambert Brau of Deakin University was facilitating the discussion. Some working groups were created in order for people coming from the same country to work together. After that, they all explained their points of view about the importance of such network and made some suggestions about the objectives to achieve and the deliverables. Basically, the comments were all positive and supportive about the idea and it was agreed to go ahead with the network.

Finally it was agreed that Dr Lambert Brau will be the coordinator of the network, a website will be created and it will be hosted at Deakin University and a trimestral Newsletter will be published by the network to share the information amongst the members and to promote the utilization of the bio fertilisers in Asia.

Perspective

LUSES should be working closely with the network as Dr Lambert Brau and Dr Alain Brauman discussed about some ways of collaboration (example of the project of Master

Class on basic soil microbiology that Deakin and Eco&Sols should organised next year in Thailand in collaboration with SUT and may be LDD). The conference will be held in China in October 2014 (Chengdu in the Province de Sichuan).

Budget

Amount requested		2800
Amount granted by LMI		2800
Total expenditures		*2800*

*Approximate amount calculated with a change rate of 39.5 Bath/€

VII. Hands-on introduction to the R environment

Project Leader	Alain Pierret

LMI partners (French)*	PPR SELTAR

Others Partners	
Western Countries	
Asian Countries	Laos, Thailand, Vietnam

Type of project	**Corresponding expenses**	**Amount (€)**
Individual application	Allowance /lab or field fees/training /travel etc.	
Exploratory Research project	Mission/ research fees/field expenses/ others	
Scientific Equipment (> 1500 €)	field supplies / Lab. supplies / equipment	
Scientific Congress, Lectures,		
Thematic school		
Others (Training course)	Travel expenses / living allowances / meals and coffee breaks / meeting room rental fee	4320

Asian Countries involved (name of the institutions)

Thailand	Vietnam	Laos	Others
- Land Development Department - Khon Kaen Universtity	Vietnamese Academy of Science and Technology	- National Agriculture and Forestry Research Insitute - National University of Laos	

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	X

Objective of the proposal

To provide an introduction to R, an "environment for statistical computing and graphics", with an emphasis on making the audience familiar with the possibilities offered by the R environment well beyond statistics only.

Achievements of the project / Problems encountered

The three days of training were devoted, as planned, to training an audience of beginners to using R and its possibilities.The first day was used to introduce the basic concepts of the R Project, how to install it and use its basic functionalities, reading data into R Project, and how to manipulate different types of variables. The second day was used to explore some of the programming options in R Project, and to introduce graphical procedures. During the second and third days, trainees spent a substantial share of time dealing with actual datasets and using the software to solve practical problems.
Overall, there was a lot of enthusiasm in the audience, even though trainees less familiar with programming concepts experienced difficulties with understanding what was presented at times. Nafri colleagues involved in soil research appreciated the presentation of libraries dedicated to soil data analysis. A major difficulty stemmed from the heterogeneous background of participants (some having advanced knowledge and skills in computing and programming, some having nearly .

Main output of the project

Overall, the training positively contributed to the knowledge sharing and capacity building objectives of the LMI-LUSES.

Perspective

It is anticipated that another R training session will be help in 2013. Several possibilities remain open such as focussing on a limited number of options / libraries while spending more time on practical exercises.

Budget

Amount requested		4600 €
Amount granted by LMI (matching funds granted by PPR SELTAR)		2400 € (2200 €)
Total expenditures		*4320 €*

*Approximate amount calculated with a change rate of 39.5 Bath/€

VIII. Purchase of a rainfall simulator for field experiment

Project Leader	Jean-Louis Janeau

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) – National Agricultural and Forestry Research Institute (Laos) – Kasetsart University (Thailand)

Others Partners	
Western Countries	
Asian Countries	University of Science and Technology of Hanoi :

Achievements of the project / Problems encountered

Yes, we ordered the Rainfall Simulator (specific manufacturer); it was delivered 7 November to the IRD in Montpellier and we will receive it in Vietnam around 12 December 2012.

Main output of the project

- ✓ To provide to LUSES partners with a specific tool useful at the 1m2 scale to understand the degradation processes of the soil which have been modified and disturbed by human activities.
- ✓ This tool will permit the development of different field experiments in the 3 partner countries of LUSES; it will contribute to answering scientific questions and how the results can be organized in an article.

Perspective

- ✓ With the rainfall simulator and other tools, we plan to realize experiments to respond to specific scientific questions (could be under summer school umbrella):
- ✓ Vietnam, March 2013. What is the export of dissolved organic matter (DOM) from forested slopes to paddy fields?
- ✓ Vietnam, October 2013. What is the nematodes ability to move between rice plants?
- ✓ Thailand (date to be defined). The first research question proposed is "characterization of the runoff coefficient, detachability and cumulated heavy metals or pollutants of the upstream and downstream of terrace taluses with and without vegetation cover".

- ✓ Laos: the date and the scientific question to be defined. One aspect could be the characterization of the runoff coefficient, detachability and cumulated under riparian vegetation cover.

- ✓ LUSES partners and students will be invited to participate to these experiments (equipment training, data collection, data processing). We will need the LUSES support to invite them during the experiments and to receive experts from different countries (travel cost, per diem, and accommodation).

We hope to have some co-funding from the SELTAR program.
Our LUSES partners should facilitate the field and the laboratory access

Budget

Amount requested		4200
Amount granted by LMI		4200
Total expenditures		*4200*

*Approximate amount calculated with a change rate of 39.5 Bath/€

IX. Soil organic matter changes with time under rubber tree cultivation

Project Leader	Nopmanee SUVANNANG

LMI partners (French)*	
Didier Brunet	IRD, UMR Eco&Sols
Henri Robain	IRD, UMR Bioemco

LMI partners (Asian)*	
Jiraporn Ninchawee	LDD OSLD chemistry
Kammarin Nimnaunrat	LDD OSLD chemistry
Wiwat Suaysom	LDD OSLD chemistry
Thuangthip Homviwut	LDD OSLD chemistry
Nattavadee Sudchalieo	LDD OSLD chemistry
Watcharaporn Pastrojna	LDD OSLD chemistry
Sudatip Janloy	LDD OSLD chemistry
Suphutcharakit Sungyoke	LDD OSLD chemistry
Suthisak Saengtharatip	Kasetsart University, Thailand

Objective of the proposal

This project had 2 objectives:

-to study the SOC variation with time under rubber tree cultivation in the framework of a muti-disciplinar study addressing soil biological, chemical and physical transformations and using an experimental chronosequence located in Chachoengsao (3 blocs, each containing 1 control field and 4 fields of increasing age)

- to train LDD staff on vis-NIRS data acquisition and on data processing using the software WINISI 3 in order to develop the capacity of local laboratory to use this cost effective method for chemical analysis of large soil sample sets

Achievements of the project / Problems encountered

- Characterization of soil layering variability using ERT along 2 profiles in each plot of the experimental chronosequence allowing to characterize the type of soil for each sampling location.
- Preparation of 216 topsoil samples collected in the experimental field (separation of roots, coarse elements and fine earth <2mm; measurement of water content)
- Acquisition of Vis-NIR spectra for the samples of Chachoengsao chronosequence (216 samples) and a collection of LDD soil samples for which calibration data were available (approx. 1000 samples)

Main output of the project

- Intensive training of LDD staff on the acquisition of Vis-NIR spectra with portable equipment (LabSpec 4 Standard-Res Analyzer, ASD inc.)
- Intensive training of LDD staff on the use on WINISI 3 for Vis-NIRS data processing (calibration and prediction)
- Assessment of the ability of Vis-NIRS method to estimate SOC and other parameters of soils (Clay, N, P, K, EC)

Perspective

- Prediction of SOC for the 216 samples collected in Chachoengsao using the calibration developed in the framework of the project leaded by F. Gay
- Validation of the prediction using soil chemical and physical analysis which will be realized at LDD.
- Development of the use of the portable VIS-NIRS system for soil analyses at LDD.

Budget

Amount granted by LMI	3000€
Total expenditures	3000€
- Didier Brunet's mission to Thailand	*1800€*
- Field survey in Chachoengsao	*700€*
- Soil preparation at LDD OSLD	*500€*