

ໂຄງການຄຸ້ມຄອງການເຊາະເຈື່ອນຂອງດິນ ໃນ ສ.ປ.ປ ລາວ: ຜົນສຳ ເລັດ, ກິດຈະກຳທີ່ກຳລັງປະຕິບັດ ແລະ ວຽກງານຄົ້ນຄວ້າສະເພາະໜ້າ ສຳລັບ ເຕັກນິກກະສິກຳ ເຂດພູດອຍ

ຄຣິສຕຽນ ວາເລນຕິນ, ໂອລິດ ແສງຕາເຮືອງຮຸ່ງ, ໂອລິເວ ຣີໂບຊີ,
ອາແລງ ປີແອເຣ, ໂອນກາ ວິຊຸກ

ບົດຄັດຫຍໍ້

ບົດແນະນຳສະບັບນີ້ ໄດ້ເວົ້າເຖິງສິ່ງທ້າທາຍ ທີ່ພົວພັນເຖິງກະສິກຳເຂດພູດອຍ ແລະ ການອະ
ນຸລັກດິນ ໃນເຂດອາຊີຕາເວັນອອກສຽງໃຕ້. ຈຸດປະສົງຫຼັກ ຂອງໂຄງການຄຸ້ມຄອງການເຊາະເຈື່ອນ
ຂອງດິນ ແມ່ນເພື່ອພັດທະນາເຕັກນິກທາງເລືອກສຳລັບກະສິກຳເຂດພູດອຍ ຊຶ່ງສາມາດປ້ອງກັນການ
ເຊື່ອມໂຊມຂອງດິນ ແລະ ປັບປຸງຊີວິດການເປັນຢູ່. ໂຄງການດັ່ງກ່າວ ໄດ້ເລີ່ມແຕ່ປີ 1998 ເປັນຕົ້ນ
ມາ ໂດຍການປະສານງານກັບ ສະຖາບັນຄຸ້ມຄອງນ້ຳສາກົນ (IWMI). ຜົນຂອງການຄົ້ນຄວ້າເຫັນວ່າ
ການປ່ຽນແປງຂອງການນຳໃຊ້ທີ່ດິນ ເນື່ອງມາຈາກການເພີ່ມຂຶ້ນຂອງປະຊາກອນ, ນະໂຍບາຍການ
ນຳໃຊ້ທີ່ດິນ ແລະ ຄວາມຮຽກຮ້ອງຕ້ອງການຂອງຕະຫຼາດ ມີຜົນກະທົບແຮງຕໍ່ການອານຸລັກທີ່ດິນ ໃນ
ເຂດພູດອຍ. ການນຳໃຊ້ທີ່ດິນຢ່າງຕໍ່ເນື່ອງ, ລະບົບຮອບວຽນ 2-3 ປີ ເກີດມີຫຍ້າຫຼາຍ, ຄວາມອຸດົມ
ສົມບູນຂອງດິນຫຼຸດລົງ, ຜົນຜະລິດເຂົ້າໄຮ່ຕົກຕໍ່າ ສຸດທ້າຍ ຊາວກະສິກອນທີ່ເຄີຍປູກເຂົ້າໄຮ່ໃນເມື່ອ
ກ່ອນ ໄດ້ຫັນມາປູກໝາກເດືອຍແທນ. ການປູກພືດໄລຍະສັ້ນ ເຮັດໃຫ້ມີການເຊາະເຈື່ອນຂອງດິນສູງ
ສິ່ງຜົນກະທົບຕໍ່ຄວາມອຸດົມສົມບູນຂອງດິນ ແລະ ຄຸນນະພາບນ້ຳ. ການປັບປຸງປ່າເຫຼົ່າ ໂດຍການນຳ
ໃຊ້ພືດອາຫານສັດ, ພືດຕະກູນຖົວ, ໄມ້ອຸດສາຫະກຳ ອາດຈະເປັນທາງເລືອກທີ່ດີສຳລັບແກ້ໄຂບັນຫາ
ດັ່ງກ່າວ. ນອກຈາກນີ້ແລ້ວ ໂຄງການຄຸ້ມຄອງການເຊາະເຈື່ອນຂອງດິນ ໄດ້ຮັບເອົານັກສຶກສາມາດຝຶກ
ງານໃນສາຂາວິຊາຕ່າງໆ ທັງໝົດ 79 ຄົນ ໃນນັ້ນ ນັກສຶກສາພາຍໃນ ມີ 43 ຄົນ ແລະ 36 ຄົນ ມາຈາກ
ຕ່າງປະເທດ. ສະນັ້ນ ພື້ນທີ່ອາງໂຕ່ງຫ້ວຍປ່າໝໍ້ ບ້ານຫຼັກສິບ ສາມາດເປັນບ່ອນສຶກສາກ່ຽວກັບການ
ເຊາະເຈື່ອນຂອງດິນ ໃນເງື່ອນໄຂການປູກໄມ້ສັກ, ໝາກເຍົາ ແລະ ບໍ່ສາ. ບົດຮຽນ ແລະ ປະສົບການ
ຈາກພື້ນທີ່ດັ່ງກ່າວ ຍັງສາມາດນຳໄປປັບປຸງໃຊ້ໃນເຂດອາງໂຕ່ງອື່ນໆ ເຊັ່ນ: ນ້ຳຄານ/ນ້ຳຖ້ຳ. ໃນບົດນີ້
ໄດ້ສັງລວມຂໍ້ແນະນຳ ແລະ ຫົວຂໍ້ການຄົ້ນຄວ້າທີ່ໄດ້ຈັດພິມ ແລະ ຈັດຕັ້ງປະຕິບັດ ຢູ່ໂຄງການດັ່ງກ່າວ.

The MSEC project in the Lao PDR: Achievements, ongoing activities and perspectives on sustainable alternative farming practices for the uplands

*Christian VALENTIN^{1,4}, Oloth SENGTAHEVANGOUNG²,
Olivier RIBOLZI⁴, Alain PIERRET⁴, Olga VIGIAK⁵*

Abstract

This introductory paper presents the overall challenges associated with upland agriculture and soil conservation in Southeast Asia and the main objectives of the Management of Soil Erosion Consortium (MSEC) to develop alternative farming practices that combat land degradation and improve household livelihoods. This international project, coordinated by the International Water Management Institute (IWMI), was launched in Laos in late 1998. One of the projects major findings is that land use changes due to increasing populations, government policies and market demand, are significantly affecting soil conservation in the uplands of the Lao PDR. Increased pressure on cultivated land has led to increased weed invasion, which has caused soil and labour productivity to decrease. When a threshold of productivity decline was reached, farmers abandoned the traditional system based on upland rice and replaced it by Job's tear and maize and short (2-3 year) fallow periods. These annual crops are clearly associated with soil losses at the catchment scale with negative impacts on soil fertility at the field scale (on site effects) and stream water quality which can affect downslope land users (off-site impacts). Improved fallow systems appear to be interesting alternatives to regular fallow. When a dense understorey is maintained, fodder crops for livestock and tree plantations can also be considered as possible improvements on the current systems with short fallow. The MSEC project in Laos has trained scientists from the National Agriculture and Forestry Research Institute (NAFRI) in catchment hydrology and management, 43 Laotian and 36 International students have also been provided with field experience in various disciplines during three to seven month long projects. In the coming years,

the Houay Pano catchment could serve as a platform for pilot studies on teak, biofuel production (Jatropha) and paper mulberry. In parallel, the MSEC collective expertise could be used at a larger scale in a similar environment (Nam Khan and/or Nam Ngum watersheds). This paper lists the main recommendations and publications which have stemmed from this extensive research project.

Key words: *Land use changes; Slash and burn systems; Soil conservation; Capacity building; Lao P.D.R*

¹Institut de Recherche pour le Développement (IRD), seconded to IWMI (International Water Management Institut), Centre IRD d'Ile de France – 32, avenue Henri Varagnat – 93143 Bondy cedex, France [christian.valentin@ird.fr]

²Institut National de la Recherche Agronomique et Forestière (NAFRI), Agriculture Land Research Center

⁴IRD, IWMI, NAFRI- c/o Ambassade de France – BP 06 Vientiane, Lao PDR

⁵DPI Rutherglen, RMB 1145 Chiltern Valley Road, Rutherglen VIC 3685, Australia. Formerly at International Water Management Institute, IWMI-Laos, Lao PDR

Introduction

In order to address endemic poverty in the uplands, the Lao PDR government has been resettling upland communities in order to ensure improved access to services such as roads, education, healthcare and markets. In addition, a specific objective of the policy is to reduce shifting cultivation in order to protect biodiversity and preserve some of the last remaining pristine forests in Southeast Asia. These land use policies together with growing market demand have resulted in rapid land use changes in the uplands over the past few years.

To study the impact of these changes on the environment and crop yields, a catchment in northern Laos was selected in late 1998 as a benchmark site for the Managing Soil Erosion Consortium (MSEC). The MSEC network, which was initially supported by the International Board For Soil Research And Management (IBSRAM) and the Asian Development Bank (ADB) and is currently funded by International Water Management Institute (IWMI) and Institut de Recherche pour le Développement (IRD), operates in five Southeast Asian countries, namely, Indonesia, the Lao P.D.R., the Philippines, Thailand and

Vietnam. This consortium supports the ultimate goal of sustainable watershed development through an approach that seeks to establish an enabling environment for sustainable use of natural resources to address the twin objectives of resource conservation and food security. An organisational model that engages scientists and research institutions to tackle a common goal was employed. The model allows the participation of those who are willing to contribute, exploits synergies, and is mutually beneficial. Research planning was undertaken through consultation among concerned National Research Institutions, International Research Centres and farmers. The whole idea of the programme is to take a bottom-up approach in research planning with iterative discussions between stakeholders to define and implement the research undertaking.

In the Lao PDR, the main objectives of the study were to: (1) Train national scientists and students in catchment hydrology, soil science, agronomy and weed science; (2) Collect and interpret scientific data on the impact of land use changes on weed invasion, crop yields, soil erosion and water quality; (3) Test alternative farming practices that would

address some of the land degradation issues associated with land use change, whilst enhancing household livelihoods.

Experimental design

As part of this study to assess the impact of land use changes on the hydrological attributes of the catchment, four hydrological gauging stations and sediment traps (weirs) were installed along the main stream of the Houay Pano catchment (60 ha), near Ban Lak Sip village, in Luang Prabang province.

Experimental instruments were also set up in four smaller sub-catchments (0.6 ha) to compare traditional slash and burn agriculture with alternative cropping systems such as rotations with fallow improved with legumes; with or without pineapple; and the “no-till plus mulch” system developed by Centre International de Recherche Agronomique pour le Développement (CIRAD). The experiments and intensive monitoring started in 2001 and are ongoing. The main biophysical and socio-economic features of this experimental site are presented in detail by Valentin et al (this issue).

Main scientific results

Some important scientific insights have emerged from this ongoing project (see list of papers below). In the Lao uplands, until the end of the 1990s, 1 year cropping periods were followed by a long fallow break of approximately 8 years; this was viewed as a sufficiently long period to restore a medium-sized secondary forest between two cropping cycles so that soil fertility and weed control could be maintained at reasonable levels. The MSEC program established that such cultivation practices generated 5.8 tons $\text{ha}^{-1} \text{yr}^{-1}$ of sediment, due to various erosion processes such as rill and gully erosion (Figure 1), during cultivation and 0.3 ton $\text{ha}^{-1} \text{yr}^{-1}$ during the fallow period. The average total annual sediment yield was therefore 0.9 ton $\text{ha}^{-1} \text{yr}^{-1}$ under this “traditional” shifting cultivation system (Figure 2). In recent years, because of the increased population density resulting from both natural growth and relocation policies, the land area available for cultivation has dropped from 1.7 to only 0.27 ha per capita. This population pressure drastically altered traditional shifting cultivation systems, so that cropping is now often conducted for two consecutive years while fallow periods have been shortened to 1 to 4 years.

Concomitantly, a rapid and significant reduction in the fraction of cultivated catchments covered by secondary forest occurred. In the Houay Pano catchment, this proportion decreased from 18 to 6% between 2001 and 2006. Until 1998, upland rice was the dominant crop cultivated in the Houay Pano catchment. Since then, because of ever increasing weed pressure, farmers have attempted to diversify their production systems by growing cash crops such as Job's tear and more recently maize. This change in cropping pattern and associated shorter fallow period has led to a dramatic increase in sediment delivery, which is now approximately double ($11.3 \text{ tons ha}^{-1} \text{ yr}^{-1}$) that of previously observed cropping phases. Overall, this more intensive system with 2-year cultivation followed by 2-year fallow periods associated with the substitution of upland rice by Job's tear, maize and cassava (Figure 3a and 3b), has led to a significant increase in average annual sediment yields, which now amount to $5.9 \text{ tons ha}^{-1} \text{ yr}^{-1}$ or an increase of 600% compared to the traditional system.

Studies undertaken in the project to investigate improved fallow systems have demonstrated that annual sediment yields can be reduced to a mere 0.1 ton

$\text{ha}^{-1} \text{ yr}^{-1}$, which is three times less than the traditional fallow. Continuous direct sowing and mulch-based conservation agriculture produced $0.7 \text{ ton ha}^{-1} \text{ yr}^{-1}$ (Figure 2c and 2d). Economic and technical constraints, such as the need for herbicide to suppress weeds, are currently limiting the adoption of the direct sowing system in Houay Pano. It seems more likely that farmers may adopt the improved fallow system, especially those who grow paper mulberry (*Broussonetia papyrifera*) from which sustainable incomes can be derived (Figure 4).

Other soil conservation management strategies were also examined by the team. Although MSEC has not carried out long-term monitoring in teak plantations in the catchment, preliminary measurements show that this popular tree crop does not provide sufficient soil protection to prevent degradation and sediment generation due to a lack of understory development (Figure 3c). In the Houay Pano catchment, sediment trapping by vegetation growing along the stream is rather limited because within the riparian zone subsurface water from the hillslope exfiltrates. Alternating the pattern of cultivated and fallow plots within the catchment so as to create a non-stationary vegetation mosaic along

the hillslopes was not found to be an efficient way to control soil erosion: this is mostly because of gully formation along steep cultivated slopes, which rapidly connects the fields where soil erosion occurs to the main stream, without interruption by sediment trapping areas. This would explain why there is a high correlation between the percentage area of cultivated land in the catchment and soil erosion.

Another significant result highlighted by the project is the importance of tillage erosion on steep slopes. Tillage erosion is the process of downhill soil translocation caused by the force applied by agricultural tools and gravity (Figure 3d). In northern Laos, weed pressure is rapidly increasing due to the shortening of the fallow period; hence increasing the number of soil tillage operations. Soil losses due to tillage increase with slope and are of the same order as those due to water erosion processes (Figure 5).

Capacity Building and knowledge dissemination

The MSEC project in Laos has trained NAFRI scientists in catchment hydrology and management. To date, 43 Lao students mainly from the Faculty of Agriculture (Annex 1) of Nabong and

36 international students (Annex 2) have been given research experience in the field under this programme (Figure 6). Two international symposiums on sustainable sloping lands management were organised in 2004 and 2006 (<http://www.nafri.org.la/>). Information and training workshop are also regularly organised. Our scientific reports are frequently published in local and international journals (See list below). This programme has also generated technical innovations (see pictures) which are suitable for use in developing countries and/or difficult field conditions.

Recommendations

Some practical recommendations and research priorities for the coming years have emerged from these initial findings. In terms of land use policy, it seems clear that more land area should be allocated to farmers to enable them to implement the improved fallow system which has proved a promising land management tool. Cash crops such as cassava, Job's tears and maize, which, in the current short fallow systems, are associated with the highest erosion rates, should not be encouraged. Upland rice, which is the country's staple crop and is of foremost cultural importance, can be tolerated as

long as it does not lead to uncontrolled use of herbicides. Weeding operations are not only extremely time-consuming but they induce land degradation through tillage erosion. Ideally, steep land should not be cropped at all but left either under fodder or tree cover. With the foreseeable development of livestock, fodder crops should be encouraged provided that cattle are not allowed to roam freely along steep hillslopes, as trampling and cattle tracks are known to lead to severe gully erosion. Tree plantations can be considered as a relevant alternative provided that they mimic the structure of native forest with a dense understorey. In this respect, teak, as currently managed, does not appear to be the best candidate.

Perspectives

Many researchers have advocated the need for long-term studies at the catchment scale, not only to monitor the impact of current land use changes on water and erosion regimes but also to capture the impact of rare climatic events and test alternative farming systems. In this respect, the team trained by the MSEC programme and the equipment installed in the Houay Pano form an invaluable observation platform worth

maintaining for the foreseeable future. On the basis of a simple set of routine measurements, this observatory field site could serve as a platform for pilot studies on teak, biofuel production (*Jatropha curcas*) and paper mulberry. In parallel, the MSEC collective expertise could be used at a larger scale in a similar environment (Nam Khan and/or Nam Ngum watersheds). In addition, the growing expertise of the present team on alternative perennial cover crops (teak, rubber tree, *jatropha*) could also be useful for studies in other environments (Vientiane plain, central and southern Laos).

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a



b



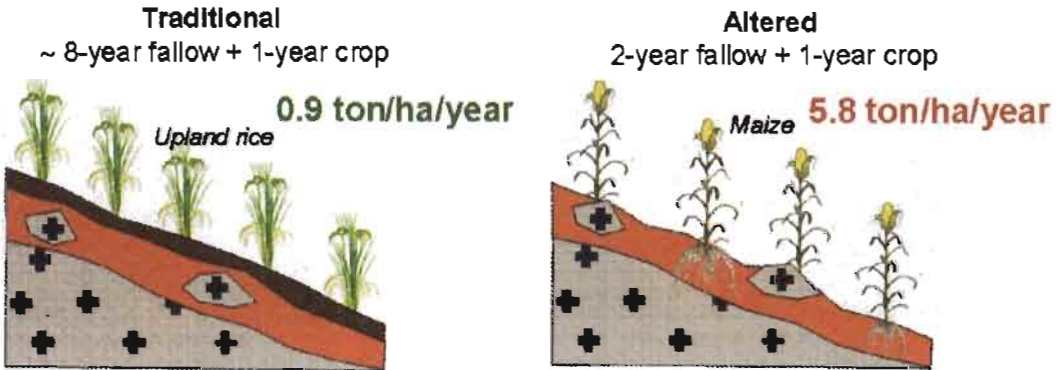
c



d

Figure 1 – Due to inappropriate cropping practices on steep land, the soil top layer is removed by runoff, which exposes underlying rocks and causes the development of gullies (a). Rills that developed at the onset of the rainy season (b), are still active even when the crop has been established (c). Sediments removed from the fields have therefore little chance to be deposited and are easily transported into the main stream down slope (d). Finer particles, which contain nutrients and organic matter, can thus be exported from the catchment and transported over long distances.

Shifting cultivation systems



Conservation systems

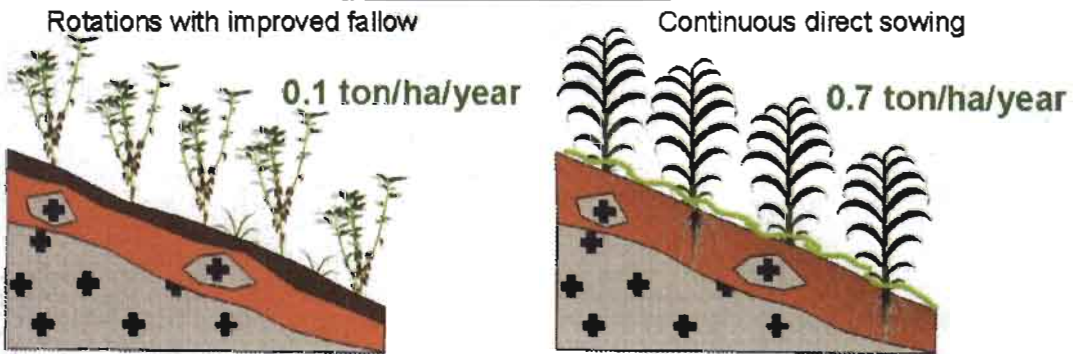


Figure 2 – Mean annual soil erosion when land is managed by a full cycle of traditional (a) and altered shifting cultivation systems (b), and two conservation systems, i.e. rotations with improved fallow (c) and continuous direct sowing (d).



a



b



c



d

Figure 3 – Cassava (**a**), maize (**b**) and teak (**c**) are not the best candidates to replace upland rice from a soil conservation perspective. Tillage erosion associated with weeding can be as serious as water erosion on steep slopes (**d**).



a



b

Figure 4 – Sufficiently long fallows (3 – 5 yrs) are effective in reducing soil erosion because they offer good soil cover. Fodder crops (here ruzi grass, *Brachiaria ruziziensis*) maintain soil cover even at the beginning of the rainy season and thus protect the soil from erosion efficiently (**a**). Paper mulberry makes these fallows economically productive due to the growing market demand (**b**).

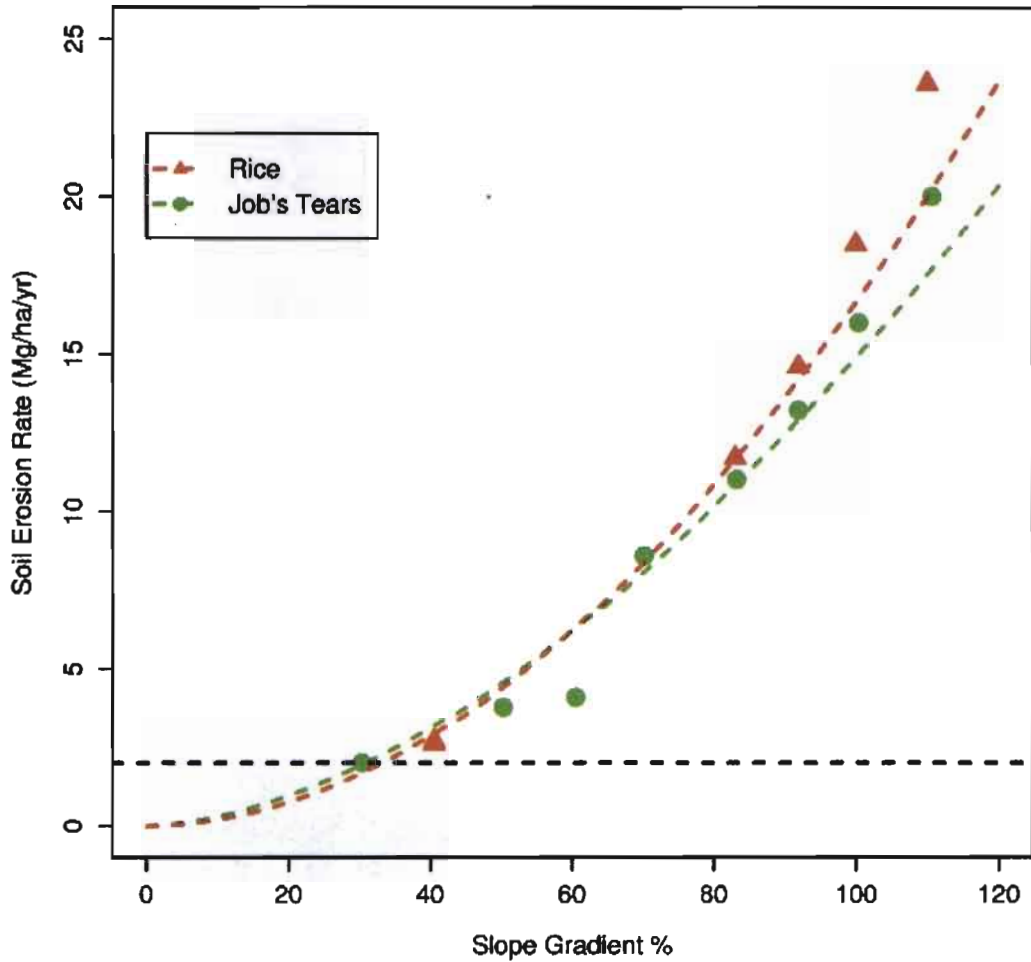


Figure 5 – Tillage erosion as influenced by slope gradient for Job's tear and upland rice.



Figure 6 – *The Houay Pano catchment and its sub-catchments are invaluable experimental field sites for training scientists and students, monitoring the impact of land use changes on hydrology and sediment yields, and testing innovative farming practices.*

Annex 1a – List of Lao students that contributed to MSEC-Laos from 2001 to 2007.

Name & surname	Year	Sexe	Diploma	Nationality	MSEC's supervisor	School/University	Shortened title
Bounsamay SOULILEUTH	2001	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Productivity of slash and burn cultivation...
Khambai PHANTHAVONG	2001	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	Assessment of soil loss ...
Bi MOA	2001	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Study of soil erosion ...
Khampaseth XAYYATHIP	2002	man	B.Sc.	Lao	Vincent CHAPLOT	FOA Vientiane	Spatial and temporal variations of runoff...
KeoOudone LADSACHACK	2002	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Weeds Population in the Cropping Systems...
Vanhthieng PHOMMASOULINH	2002	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Yield Factor and Component of Job's Tear...
Sengsavanh MIXAY	2002	man	B.Sc.	Lao	Vincent CHAPLOT	FOA Vientiane	Controlling Factors of Organic Carbon ...
Bounmy KEOHAVONG	2002	man	H.D.	Lao	Christian VALENTIN	FOA Vientiane	Gully Erosion...
Thanongkham VENETHONGKHAM	2003	man	B.Sc.	Lao	Vincent CHAPLOT	FOA Vientiane	Evaluation of Soil Erosion...
Kongmany THAMMAVONGSAY	2003	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Impact of soil erosion...
Kolakanh CHANTAVONG	2003	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Jobs'tear Cultivation, Improved fallow ...
Pheng Hey XAY CHOU	2003	man	B.Sc.	Lao	Vincent CHAPLOT	FOA Vientiane	Rill Erosion in a 60 ha Catchment...
Sengkeo TASAKET	2003	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	The Assessment of Water Erosion...
Khosada VONGSANA	2004	man	Engineer	Lao	Anneke DE ROUW	ESA d'Angers	Suivi Agronomique d'une jachere...
KeoUdom PHAYAXAY	2004	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Study and compare number of weeds ...
Kethsadong SILYTHONE	2004	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	Study the Teak effect in Steep with Soil...
Khamko THAMMAVONG	2004	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	Assessment tillage erosion by Hmong...
Phoutasene DUANGKEO	2004	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	Assessment of Rill Erosion in Houay Pano...
Hatsadong CHANTHANOUSONE	2005	man	H.D.	Lao	Anneke DE ROUW	FOA Vientiane	Weed seed Dispersal during Rainstorms...
Linh SOUKKHAMTAT	2005	man	B.Sc.	Lao	Anneke DE ROUW	FOA Vientiane	Weed-crop Competiton in Smallholders...
Inpaeng DOUANGVONGSA	2005	man	B.Sc.	Lao	Olga VIGIAK	FOA Vientiane	Characterisation of Vegetations...
Saiphone INTALA	2005	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	Comparison of the Impacts of...
Phouthone CHANTHAVONGSA	2005	man	B.Sc.	Lao	Alain PIERRET	FOA Vientiane	Monitoring of fine root dynamics...

Annex 1b – List of Lao students that contributed to MSEC-Laos from 2001 to 2007.

Name & surname	Year	Sexe	Diploma	Nationality	MSEC's supervisor	School/ University	Shortened title
Sayyavong VANTHALATH	2005	man	H.D.	Lao	Christian VALENTIN	FOA Vientiane	Runoff generation and soil...
Sisomphone SOUTHTAVONG	2005	man	B.Sc.	Lao	Olivier RIBOLZI	FOA Vientiane	Study on Groundwater-Surface...
Sith PHALY	2005	man	H.D.	Lao	Anneke De Rouw	FOA Vientiane	Improved fallows in the Nam Ou...
Sounthom PHALI	2006	man	B.Sc.	Lao	Olivier RIBOLZI	FOA Vientiane	Investigating mechanisms of storm...
Khankham APHAIVONG	2006	man	B.Sc.	Lao	Olga VIGIAK	FOA Vientiane	Sediment trapping efficiency...
Khonesavanh BOUNYAVONG	2006	man	B.Sc.	Lao	Alain PIERRET	FOA Vientiane	Monitoring of root growth dynamics...
Dunlam LUANGKONGKHAM	2006	man	B.Sc.	Lao	Olivier RIBOLZI	FOA Vientiane	Subsurface features of soils...
Nou YANG	2006	man	B.Sc.	Lao	Christian VALENTIN	FOA Vientiane	Runoff generation and soil...
Souanguene SIPHONESAY	2006	man	H.D.	Lao	Jean-Pierre THIEBAUX	FOA Vientiane	Erosion process and soil losses...
Sounyadeth THEBPHALACK	2006	man	B.Sc.	Lao	Olivier RIBOLZI	FOA Vientiane	Hydrology and floods generation...
Touan VONGVIHAN	2006	man	H.D.	Lao	Olivier RIBOLZI	FOA Vientiane	Monitoring sediment concentration...
Alounsavath CHANPHENGSAI	2006	man	B.Sc.	Lao	Anneke De Rouw	FOA Vientiane	Survey on land use changes...
Anan BOUATHONG	2007	man	H.D.	Lao	Christian VALENTIN	FOA Vientiane	Runoff Generation and Soil...
Phouthong PHOTHISAT	2007	man	B.Sc.	Lao	Jean-Pierre THIEBAUX	FOA Vientiane	Study of Soil Erosion...
See Xiong CHIAKOUA	2007	man	B.Sc.	Lao	Yann LE TROQUER	FOA Vientiane	Assessment of soil water content...
Axue XONGYERMOUS	2007	man	B.Sc.	Lao	Olivier RIBOLZI	FOA Vientiane	Comparison of Productivity of Two...
Vue Xiong Lee VUE HER	2007	man	B.Sc.	Lao	Emmanuel BOURDON	FOA Vientiane	Assessment of Allelopathic Effects...
Phonesay SENGSOULYCHANH	2007	man	H.D.	Lao	Olivier RIBOLZI	FOA Vientiane	Effect of Land Uses on Surface Water...
Chanthanosone THAMMAHAKSA	2007	man	H.D.	Lao	Alain PIERRET	FOA Vientiane	Soil Indicators of Mainstream Groundwater...

Annex 2a – List of European students that contributed to MSEC-Laos from 2000 to 2007.

Name & surname	Year	Sexe	Diploma	Nationality	MSEC's supervisor	School/University	Shortened title
Ilia CORONEL	2000	female	Engineer	French	Catherine AUBERTIN	INA Paris Grignon	Etude d'un système agraire...
Prudence CAILLENS	2000	female	Engineer	French	Catherine AUBERTIN	INA Paris Grignon	Etude d'un système agraire...
Ice DUPIN	2001	man	Engineer	French	Christian VALENTIN	ISTOM	Estimation des pertes en terre...
Stéphane JULLIEN	2001	man	Engineer	French	Anneke DE ROUW	ISTOM	Impact de la baisse du temps...
Yvan PHILIPPE	2001	man	Engineer	French	Anneke DE ROUW	INA Paris Grignon	Study of weeds ...
Yves GIBOIRE	2001	man	Engineer	French	Vincent CHAPLOT	WAGENINGEN University	GIS-based dynamic integrated...
Stéphanie GAY	2002	female	Engineer	French	Anneke DE ROUW	ISTOM	Dynamique des populations...
Yvan COADOU LE BROZEC	2002	man	Engineer	French	Vincent CHAPLOT	ISTOM	A case study with Houay Pano...
Yvan-Philippe VENOT	2002	man	Engineer	French	Anneke DE ROUW	INA Paris Grignon	L'abattis/brulis: un système...
Yves TESSIER	2002	man	Engineer	French	Vincent CHAPLOT	ISTOM	L'abattis/brulis: un système...
Yves JONSSON	2002	man	B.Sc.	Swedish	Vincent CHAPLOT	UAS Sweden	Erosion and land use...
Yves MELIN	2002	man	B.Sc.	Swedish	Vincent CHAPLOT	UAS Sweden	Erosion and land use...
Yves NILSSON	2002	man	B.Sc.	Swedish	Vincent CHAPLOT	UAS Sweden	Erosion and land use...
Yvonne DUMAS DE RAULY	2003	female	Engineer	French	Anneke DE ROUW	INA Paris Grignon	Etude de l'impact de l'érosion...
Yvonne ALEXIS	2003	female	M.Sc.	French	Sylvain HUON	UPMC Paris	Influence du mode de culture...
Yvonne BERNADOU	2003	female	Engineer	French	Vincent CHAPLOT	ENSA Rennes	Runoff, soil and soil organic...
Yves LESTRELIN	2003	man	Ph. D.	French	Christian VALENTIN	University of Durham	Changing life, changing nature(s)...
Yvonne PELLETREAU	2004	female	M.Sc.	French	Christian VALENTIN	University of Paris	Pricing soil degradation...
Yvonne THEVENET	2004	female	Engineer	French	Anneke DE ROUW	INA Paris Grignon	Suivi de l'implantation d'une...

Annex 2b – List of European students that contributed to MSEC-Laos from 2000 to 2007.

name & surname	Year	Sexe	Diploma	Nationality	MSEC's supervisor	School/University	Shortened title
Christian CASAGRANDE	2004	female	Engineer	French	Anneke DE ROUW	INA Paris Grignon	The seedbank in slash and burn...
Guillaume ROBIN	2004	man	Engineer	French	Vincent CHAPLOT	Agrocampus Rennes	Evaluation de la sédimentation...
Christophe FRERE	2004	man	M.Sc.	French	Christian VALENTIN	ULP Strasbourg	Etat de surface et paramètres physiques...
Christine DOUILLET	2005	female	Engineer	French	Anneke DE ROUW	INA Paris Grignon	Weed seed dispersal during rainstorms...
Thierry SAINTE CLUQUE	2005	man	Engineer	French	Norbert SILVERA	Groupe Esiee Pairs	Conception de pluviographes...
Christophe NEGRE	2005	man	Engineer	French	Anneke DE ROUW	INA Paris Grignon	Compétition riz pluvial/adventices...
Christophe DUVERT	2005	man	B.Sc.	French	Olivier RIBOLZI	Université d'Avignon	Study of groundwater/surface water...
Christophe HUA	2005	man	Engineer	French	Christian VALENTIN	Institut Polytechnique, Paris	Stage de "contact humain"...
Christine VIGIAK	2005	female	Post-Doc	Italian	Christian VALENTIN	Sponsored by IWMI	Trapping efficiencies of cultivated...
Christine VAN BREUSEGEM	2006	female	M.Sc.	Belgian	Olga VIGIAK	WAGENINGEN University	Sediment trapping capacity...
Christine PUDDU	2006	female	M.Sc.	French	Olivier RIBOLZI	Hydrogéologie Neuchatel	Interactions hydrologiques nappe-ruisseau...
Christine LAIR	2006	female	M.Sc.	French	Alain PIERRET	ENSA Montpellier	Comparaison des propriétés structurales...
Christophe MARTIN	2006	man	Engineer	French	Olivier RIBOLZI	ENSG Nancy	Modélisation du transport de soluté...
Christophe ROUVEIROLLES	2006	man	Engineer	French	Anneke DE ROUW	ENSA Montpellier	Ecology and productivity of paper mulberry...
Christine LEBRETON	2007	female	Engineer	French	Olivier RIBOLZI	INSA Rennes	Rôles de l'occupation des sols...
Christine MOUSQUES	2007	female	Engineer	French	Alain PIERRET	ENITA Bordeaux	Etude de faisabilité pour la mise en place...
Christine CUNY	2007	female	Engineer	French	Olivier RIBOLZI	ENSG Nancy	Etude de la qualité de l'eau d'un ruisseau...
Christophe B. VAN DER HELM	2007	man	M.Sc.	Dutch	Olga VIGIAK	WAGENINGEN University	Evaluating alternative land use scenarios...
Christophe GALVEZ	2007	man	M.Sc.	French	Olivier RIBOLZI	ENS Paris	Experiment and modelling of nitrate transfers...

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Joint Editors:

Dr. O. Ribolzi

Dr. A. Pierret

Dr. L. Gebbie

Mr. O. Sengtaheuanghoung

Honorary Editor:

Dr. M. Chanphengxay

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