

PROPOSED IMPACTS STUDIES

The proposed impacts studies came up after various processes of small group discussions and are based on the current understanding of soil degradation and the usage of modelling tools. It is expected that the individual country proposals may be submitted for funding and implementation.

5.1. CAMBODIA

High pesticide use in agricultural lowland area of Tasaang Village, Svay Rieng Province in Cambodia has motivated the Cambodian Team to propose the study of the impacts of pesticide application on the soil environment. Statistics show that there is a heavy use of pesticide in Svay Rieng Province and this may have caused among others, the decline of rice production in the area.

The objectives of the study are:

- to study the soil biodiversity in the area;
- to examine the impacts of pesticide application on the biological aspects of soil fertility and its degradation; and
- to improve farmers' practices in pesticide application

Expected results of this study include improved soil fertility of the area, decreased soil degradation, increased production yield, and improved farmers' practices.

5.2. INDONESIA

Population pressure has substantially reduced the area of productive rice-land in Java. It is estimated that 6,000–9,000 ha per year of rice-land in Java have been converted into housing, factory and other non-agricultural land-use purposes. Realising a fast decrease of productive rice-land in Java, intensification of agriculture in the outer islands has become a government priority to compensate for the loss of area and production. One of the biggest concern in such program is the impact of massive land-use change brought about by the deforestation on soil biodiversity and fertility, water and nutrient balance, greenhouse gas emission, and eventually to climate change.

Intensifying the use and changing the agroecosystem of such area, however, will also lead to several environmental consequences. Flooding the peat soil for example will create anaerobic condition, which may lead to the emission greenhouse gas emission, especially methane. The change in moisture regime will also affect the macro and micro fauna diversity in the soil.

In spite of large amounts of peat soil and swamp area converted to agricultural land, especially to rice-land, few data is available at the present, on the contribution of such changes to the functioning of the soil in greenhouse gas emission and sequestration.

Considering a wide range of agricultural techniques, which may be practised in such area, modelling is required to assess the impact of each agricultural technique chosen. A database is urgently required to develop a model suitable for such conditions.

Based on the rationale above, the Indonesian Team proposed a study on the impacts of land-use and -cover change on greenhouse gases emissions and the soil environment in the Kalimantan peat land development area. The objectives of the study are:

- to study GHG emission, soil biodiversity, and water and soil pollution in Kalimantan peat soil; and
- to select the technologies for decreasing gases emission, increasing soil biodiversity, and decreasing water and soil pollution.

The research activities will be divided into three stages. The first activity involves collecting information and secondary data on biophysical conditions of 'Peat land Development Project' area in Central Kalimantan Province; to select sites representing initial condition (Swamp Forest), after land clearing, and different stages of rice cultivation.

The second stage comprises of fieldwork to set up plots on the selected sites representing the stages of land development. Variables observed in each plots include: carbon stocks, macro- and microbial diversity, GHGs, quality of ground water and irrigation/drainage canal, and some soil physical and chemical properties. The variables will be used to simulate scenarios of crop production and changes in environmental conditions using Century 4 Model.

The third stage consists of a long-term field experiment applying several options of technology on water management, crop residue management, and cropping systems. Variables observed in each plot include: carbon stocks, soil macro- and micro-fauna diversity, GHGs, quality of ground water and irrigation/drainage canal, and some soil physical and chemical properties. The variables will be used to validate and modify Century 4 Model.

The expected outputs of the study are a modified model from Century that has been validated for specific area, and alternatives for appropriate conservation farming technologies, which are more environmentally sound.

5.3. MALAYSIA

The world market of oil palm attracts some tropical countries, including Malaysia to develop oil palm plantations. In Malaysia, a large proportion of forests has been converted

into oil palm plantation. The total conversion will be about 2 million ha by the year 2000. Geographically, about 60% of land area in Malaysia are steep-lands. So that one of the problems raised in oil palm plantation development is encroachment of oil palm plantation into steep-lands. Based on this condition, the Malaysian Team proposed the study on the impacts of tropical forest conversion into oil palm plantation.

The objectives of the study are:

- to assess soil erosion due to jungle clearing and establishment of plantations;
- to investigate the impact of conversion on soil micro- and macro-fauna;
- to examine C-stock changes and GHGs; and
- to study the impact on mammal distribution.

To conduct the study, the team will use the following methodology:

- 1) Site selection and survey.
- 2) Secondary data collecting from relevant agencies.
- 3) Field sampling and measurement on forest and oil palm area.
- 4) Laboratory analysis.

The study will use the Century Model and ESCAPE model. Century will be utilised for modelling of SOM and C-stock, and ESCAPE will be used for modelling of CH₄, CO₂, and N₂O.

From the study, the team expects to gain the following outputs:

- baseline data of soil properties from different land-uses;
- enhancement of knowledge on the impact of deforestation on soil environment; and
- documentation of findings for utilisation by relevant agencies.

5.4. PHILIPPINES

The present communities in the Philippines have a long history of association and interaction with the dominant agricultural land-use system they are in. Some date back to colonial days, *e.g.* sugarcane and coconut plantations. The long period of association between the communities and the land they work on must have already evolved, in that particular setting, characteristics that are unique to both people and the ecosystem. Those unique characteristics can be summed up into a concept of sustainability. In the context of global change and sustainable development, there are issues that have to be resolved. Are these communities sustainable? What unique features of the ecosystem and the community have evolved over time? Can they be translated into policies to guide community-based development in the future? These questions are seldom asked, but answers to them would

provide knowledge that would be useful to decision and policy-makers, both at the national and regional levels.

Based on the rationale above, Philippines' Team proposed a study entitled 'Sustainability of Communities in Some Major Land-uses in the Philippines. The present proposal will investigate the sustainability of community development, which are based on the following major land-uses:

- industrial Falcata plantation;
- industrial rubber plantation;
- sugarcane plantation;
- banana plantation;
- mixed cropping; and
- logging with Timber License Agreement (TLA).

The objectives of the study are:

- to develop indicators for sustainable development;
- to determine the ecological, economic and socio-cultural sustainability of communities based in major land-uses in the Philippines using models and field surveys;
- to validate the models such as WaNuLCAS, CENTURY, and CenW;
- to develop model for sustainability based on the above indicators; and
- to make policy recommendations for future community-based development in the Philippines.

Methodology that is set up in the study is:

- 1) Identification of major land-uses with historical records.
- 2) Development of indicators for ecological, economic and socio-cultural sustainability.

The term "sustainable development" in this proposal refers to the type of community development process, which is ecologically sound, economically feasible, and socially acceptable. Therefore, sustainable community development should be able to pass the tests for ecological sustainability, economic sustainability and socio-cultural sustainability. These tests will be applied using the following indicators:

Ecological sustainability indicators, such as productivity, carbon stock, GHG exchange, biodiversity, water quality, and, nutrient cycling.

Economic sustainability indicators, such as income, employment security, and market viability.

Socio-cultural sustainability indicators, such as people's participation, access to resources, demography, equity, and self-reliance.

- 3) Conduct of social research survey in identified areas.
- 4) Make measurements of sustainability indicators as stated above.

The study is expected to be able to make some outputs, such as sustainable land-use types, improved models, and new models for sustainability, and policy recommendations.

5.5. THAILAND

The Thai Team proposed a study on the impact of land-use change and salinisation in the Mae Klong Basin. A prominent feature of land-use change in Mae Klong Basin has been the conversion of rice fields into sugarcane plantation. Due to high transpiration rate of sugarcane plantation, the team presumed that this change might cause changes in ground water flows that can affect the salt intrusion. Yet, the soil salinisation will modify other soil environments, such as nutrient cycle, SOM, microbial activity, and GHGs emission, which will decrease soil productivity.

The team will develop a model for the soil salinisation process due to land-use change. This salinisation model will then be linked to soil models, such as WaNuLCAS or Century with some modifications, for modelling the changes in the soil environment. The final output of the study will be modified models, which could evaluate the impact of salinisation to the soil environment.

5.6. VIETNAM

Vietnam covers a natural area of 33 million ha, where about 43% of the area are fallow lands, as consequence of deforestation from either human activities or natural disaster factors, such as forest fire. Most of the bare-land area is situated on the hilly area, where soil has been degraded (strongly eroded, poor in nutrients, and very acid). The main human driving factors affecting the deforestation are forest exploitation without good planning and shifting cultivation by the farmers. Those factors are mainly caused by the lack of knowledge in sustainability of soil productivity.

The Vietnam Team proposed a study entitled "the Soil Conservation Measures in the Mountainous Areas of Vietnam", with the objectives:

- to investigate the farmer's activities;
- to improve the farmer's knowledge;

- to improve the farmer's living and ecological conditions;
- to avoid erosion;
- to increase soil fertility; and
- to maintain soil moisture.

To achieve the objectives, the team will set up experiments to develop the most suitable form of agroforestry system in the study site area from some options, such as silvipasture, apiculture, agrosilvipasture, and sericulture. In term of soil conservation method, the team will also apply SALT (Sloping Agriculture Land Technology) Program. For studying the impacts of the applied system on the soil environment, the team will use Century and CENW as the modelling tools.

The study is expected to gain some outputs:

- analysis result of the management effects on productivity;
- sustainable site productivity;
- simulation of complex agricultural systems management; and
- understanding in growth determining processes.

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READING MATERIALS

The following reading materials were provided to the participants for their future reference. They are grouped into various headings with regards to the topic and area of this workshop. Copies of the reading materials can be found at IC-SEA library.

 LUCC AND GHG FLUXES

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WORKSHOP EVALUATION

EVALUATION BY PARTICIPANTS

All training workshops conducted by IC-SEA are evaluated both by participants and trainers, who are asked to rate their satisfaction on items relevant to the workshop using the system: 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent). The table below summarises the participants' evaluation:

Workshop Items	Details	Average Score
Pre-workshop information	-	4.11
Trainer's presentation (clarity, usefulness of content, adequate time), time for hands-on exercises/discussion, knowledge gained	Global change, land-use change & GHG emission (DM)	4.10
	Soil macro-fauna (FS)	3.91
	Soil C stock and SOM dynamics (KH)	3.97
	Tree-crop interaction and WaNuLCAS (MN)	3.81
	Soil micro-fauna (RS)	3.50
	Century (ST)	3.73
	CENW (MK)	4.03
Usefulness of laboratory sessions	-	4.27
Course & reading materials	Sufficient	4.32
	Quality	4.22
	Usefulness for future reference	4.36
Country reports	-	3.96
Field work	-	4.46
Services	-	4.40
Facilities	-	4.00

Codes for trainers:

DM : Dr Daniel Murdiyarso, IC-SEA, Bogor, Indonesia

FS : Dr F.X. Susilo, Faculty of Agriculture, Lampung University, Bandar Lampung, Indonesia

KH : Dr Kurniatun Hairiyah, Faculty of Agriculture, Department of Soil Science, Brawijaya University, Malang, Indonesia

MK : Dr Miko U.F. Kirschbaum, CSIRO Forestry and Forest Products, Australia

MN : Dr Meine van Noordwijk, ICRAF Southeast Asia, Bogor, Indonesia

RS : Dr Robert Simanungkalit, Agency for Agricultural Research and Development, Ministry of Agriculture, Indonesia

ST : Dr S. M. Sitompul, Faculty of Agriculture, Department of Soil Science, Brawijaya University, Malang, Indonesia

EVALUATION BY TRAINERS

The results of the trainers' evaluation are shown in the table below:

Workshop Items	Details	Average Score
Quality of Participants	Preparedness	4.00
	Motivation	4.80
	Interest	4.80
	Initiative	4.00
	Understanding	4.00
Adequate Time for Lectures and Exercise	-	4.20
Course and exercise materials	Sufficient	3.60
	Quality	3.50
	Usefulness	4.00
Workshop Guide	-	4.80
Services	-	4.58
Facilities	-	4.20



The Global Change and Terrestrial Ecosystems (GCTE), is one of the five Core Projects of the International Geosphere-Biosphere Programme (IGBP). Its objectives are built around two major themes — feedforwards (impacts) and feedbacks of global change to the terrestrial ecosystems — and include the entire range of terrestrial ecosystems, from pristine natural systems to intensively managed agricultural systems. Its Core Research Programme consists of 48 contributing projects involving over 700 scientists and technicians from 41 countries. They are organised in scientific frameworks, which consists of four Foci and a large number of Activities and Tasks.



START — The Global Change SysTem for Analysis Research and Training — primary objective is to provide support for regional research related to global change. It is supported by three international global change science programmes: IGBP, World Climate Research Programme (WCRP), and International Human Dimensions of Global Environmental Programme (IHDP). Its head quarter based in Washington D.C., USA is very active in coordinating, and obtaining funds for training courses, workshops, fellowships and visiting lectureships related to global change research and capacity building. The Southeast Asian regional centre known as SARCS is based in Bangkok, Thailand. It was directly involved in the establishment of IC-SEA at BIOTROP, Bogor. SARCS continues to be involved with IC-SEA, providing a supporting network for distributing information about IC-SEA activities, and participating in the project steering committee.



Funds for the initial establishment and first three-and-a-half years of operations of IC-SEA are provided by the Australian Agency for International Development (AusAID) through a grant to CSIRO, Division of Wildlife and Ecology. It is envisaged that the Centre will later become self-supporting through partnerships and grants for global change impacts assessment and sustainable management studies.



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