


A small Grant of “FIRST” project Laos and Cambodia 2017-2018

FIRST: Functional IndicatoR of Soil ecosystem

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ALiSEA General Meeting on **Tuesday 25th of July2017**, *Vientiane Lao PDR.*

Outline

- **About FIRST Project**
- **Impact of Agricultural practices**
- **Biofunctool equipments package**
- **Case stady of annual crop in Northern Laos.**

About FIRST Project

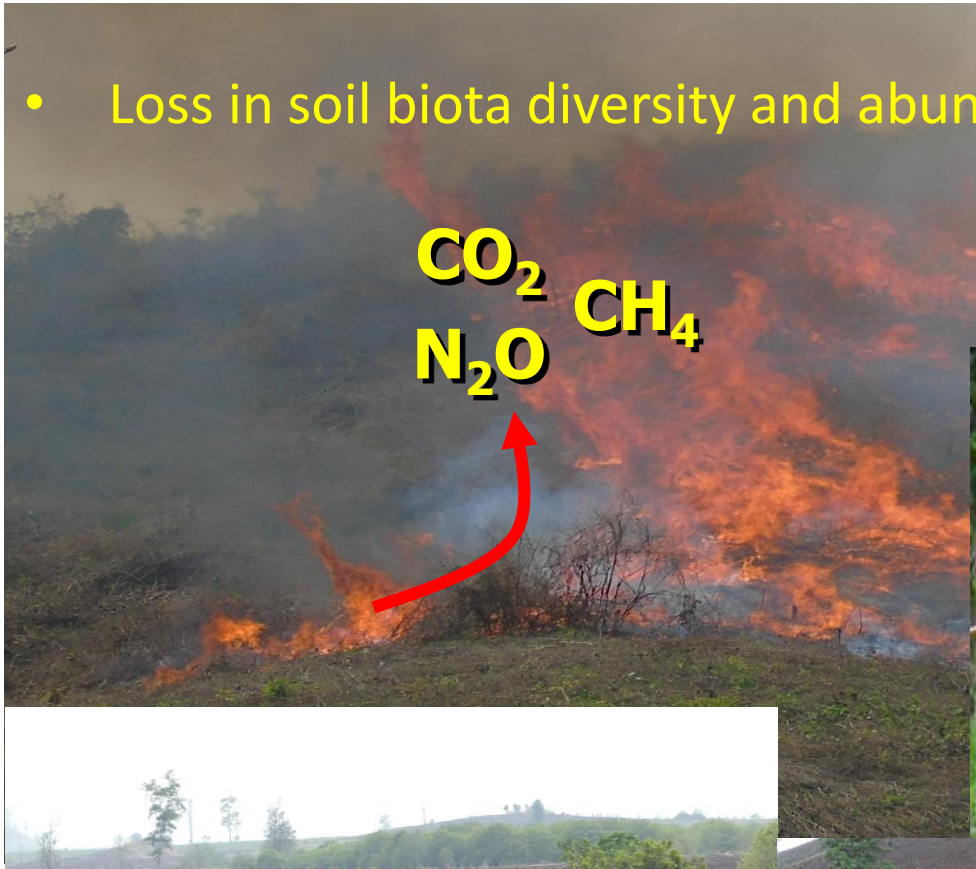
- FIRST Project: Functional IndicatoR of Soil ecosystem
- The project will contribute to the capacity building of young researchers and practitioners in Laos and Cambodia.
- Project activities will bring together different CANSEA partners (e.g. CIRAD, DALaM, MAFF-GDA) and key research & training institutions in SEA (e.g. IRD, KU, KKU, LDD, RUA, ITC).
- Soil biological functioning assessment by difference tool of biofunctools.
- Contributed fund by CANSEA, (NUDP-EFICAS , ACTAE/CANSEA, SEARCA).

Objective

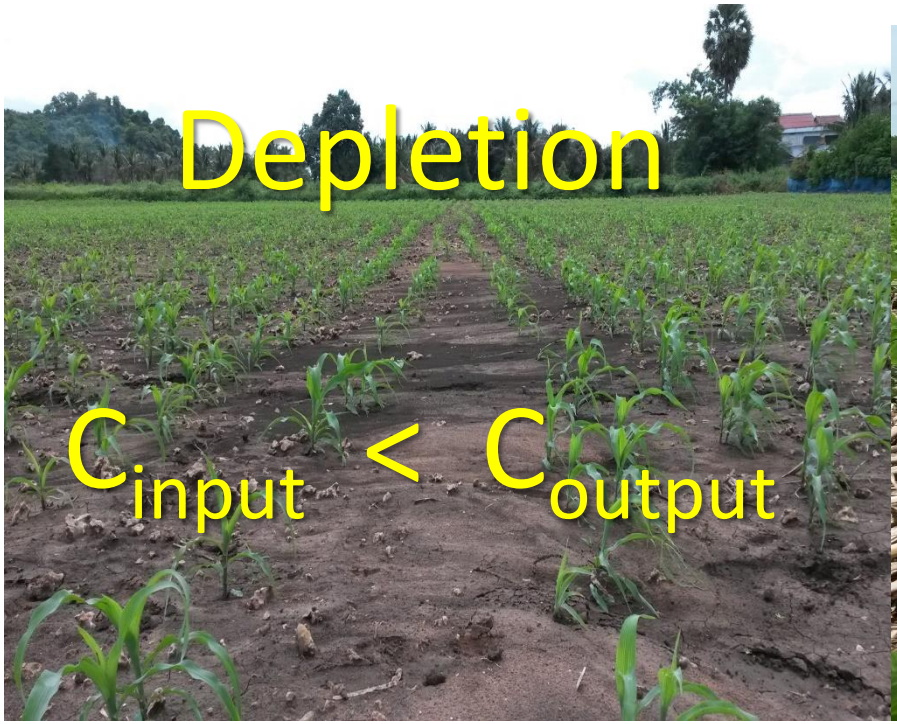
- Build capacity
- Harmonize methods and tools
- Test and assess the relevance of bio-functional tools for a range of farming systems/soil conditions in the region
- Contribute to the emergence of a regional network of scientists, teachers, and practitioners working on soil quality assessment and improvement

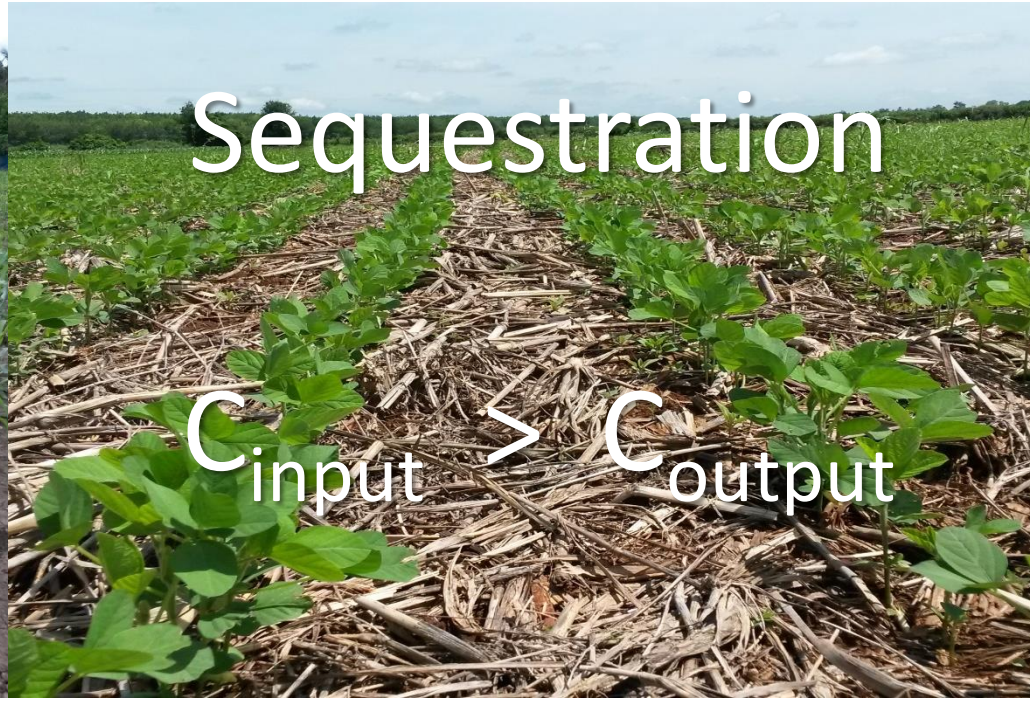
Impact of Agricultural practices

- Loss in soil biota diversity and abundance



Transitions Agricultural practice





Soils need to be recognized and valued for their productive capacities as well as their contribution to food security and the maintenance of key ecosystem services

Enhancing ecological processes

Biodiversity (plants, fauna and microbial communities) **is the engine** that drives soil-crop interactions and enhances ecosystem services (regulation and provision)

Rain-fed lowland (80% sand)

Cropping systems in Cambodia: design and assessment


Maize + finger millet + sunnhemp


Early maize followed by cassava


Soybean after sorghum


Maize with Pigeon pea


Farmer field of maize in Battambang


Dry season cassava

How to measure soil quality

It is generally assessed by measuring a minimum data set of

Physical properties

- bulk density,
- water content,
- infiltration rate,
- aggregate stability,
- slaking, and morphological estimations.

Soil chemical properties

- OM content,
- pH,
- electrical conductivity (EC),
- soil nitrate levels.

Biological properties

- Soil respiration
- Earthworms.

BIOFUNCTOOL

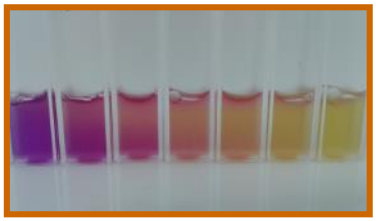
Expectation for selecting the tools:

- Directly assess one of the soil function (Kibblewhite et al., 2008)
- Allow In-Field measurements
- Give an as exhaustive as possible view of the soil interactions
- Do not require specific skills
- Be time and cost effective

➔ **A set of 9 tools has been developped**

BIOFUNCTOOL

Litter Index
Adapted from
Ponge et al. 2002



SituResp
Thoumazeau et al.
Paper on process

C Transformation

BIOFUNCTOOL SET

Biofunctools

- T_0: Soil available nutrients
- $T_{+10\ days}$: Ion exchange membranes

Qian and Schoenau, 2002

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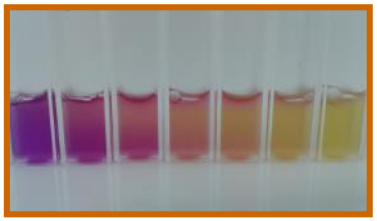

SituResp
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Nutrient Cycling

C Transformation

BIOFUNCTOOL SET

Permanganate Oxidable Carbon
Weil et al. 2003

Beerkan Test
Adapted from
Lassabatère et al., 2006

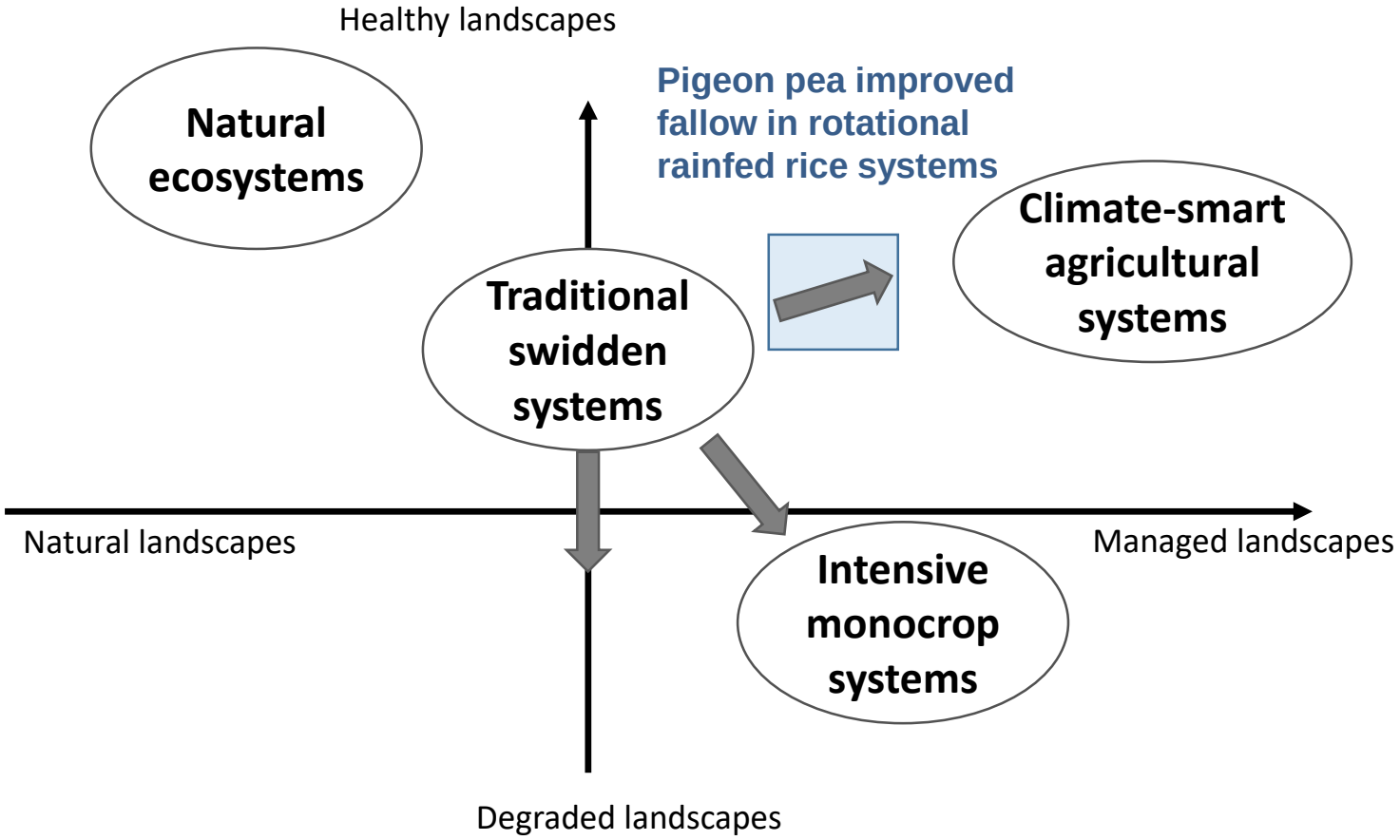
Struct

Bait Laminas
Törne, 1990

Visual Evaluation of Soil Structure
Ball et al., 2007

Water Aggregate Stability
Herrick et al., 2001

Biofunctools case studies targeted within the FIRST project: 2 opportunity windows towards climate-smart agricultural systems in northern Laos



Adapted from Griffon, 2013

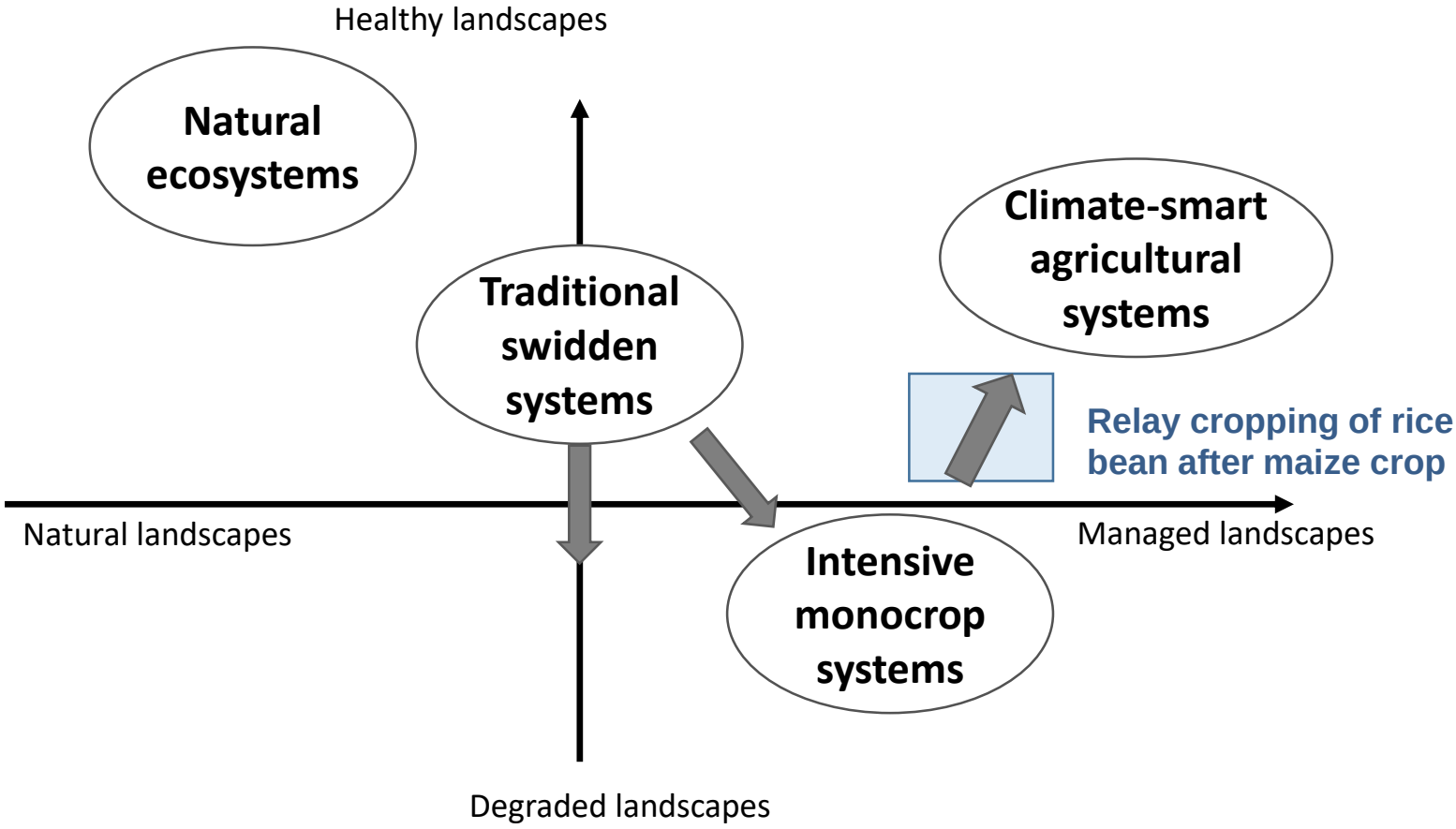
Pigeon pea improved fallow in rotational rainfed rice systems

- Pigeon pea as a multipurpose crop
  - Stick lac production
  - Pods and grain consumption
  - Soil fertility improvement (N symbiotic fixation + biomass)

Pigeon pea improved fallow in rotational rainfed rice systems

- Intercropped with rice (simultaneous sowing) at low density (2m x 2m)
- 3 paired-plots (rice monocropping vs rice intercropped with pigeon pea) in 2 villages of Pakseng district, Luang Prabang Province

Biofunctools case studies targeted within the FIRST project: 2 opportunity windows towards climate-smart agricultural systems in northern Laos



Adapted from Griffon, 2013

Relay cropping of rice bean after maize crop

- Context of land degradation issues related to 15 years of continuous maize monocropping under tillage and no fertility management

Relay cropping of rice bean after maize crop

- Rice bean as multipurpose crop:
  - cash crop
  - Weed control
  - Soil fertility improvement
- Intercropped with maize (delayed sowing), 12-15 kg/ha
- 3 paired-plots (maize monocropping vs maize intercropped with rice bean) in 2 villages of Khar district, Xieng Khouang Province

Thank you for your attention…

For more information:

www.eficas-laos.net