Investing into Soil Organic Carbon management for resilient and low emissions upland farming (ISOC)

Battambang (Rattanak Mondoul district)

Background

The effects of land use and land cover changes on soil organic carbon stocks are of concern in the context of international policy agendas on greenhouse gas emissions mitigation and fight against land degradation.

The **land conversion** was associated with a marked depletion of soil fertility, erosion of lands and biodiversity, and increasing use of chemical inputs that can gradually undermined the sustainability of the upland farming systems and the adaptation to climate change.

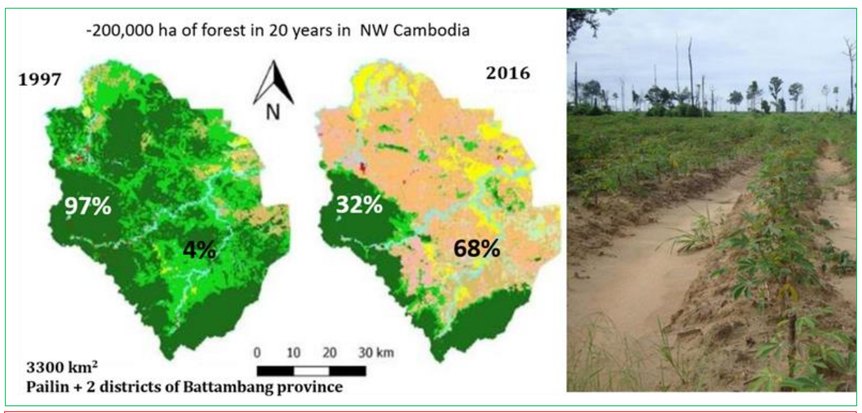


Figure 2: Land use and land cover changes over the last two decades in the North-western region of Cambodia (from Kong et al., 2019). White numbers: change in forest coverage between 1997 and 2016. Black numbers: change in crop cultivation between 1997 and 2016.

Objectives

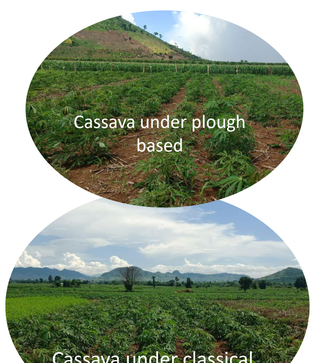
- **Overall**, ISOC aims at contributing to improved understanding of the climate change mitigation and adaptation impacts of conservation agriculture through the assessment of soil organic carbon and ecosystem services for annual upland cropping systems.

- **Specifically**, (i) to assess the impact of the continuous plow-based CT on SOC stock vis-a-vis the native vegetation, (ii) quantify the magnitude of SOC increase under CA-based cropping systems, (iii) assess the impacts of conventional plough-based management and CA-based cropping systems on multiple ecosystem services on farms (supporting, regulating, provisioning, non-marketed services) and (iv) feed policy dialogue via the National Council on Sustainable Development and the Conservation Agriculture and Sustainable Intensification Consortium

Key technologies and approaches introduced

The study contributes to enrich the GHG inventory **assessing the changes in SOC under different land uses** with an assessment of the depletion (from forest to cultivated lands) and of the restoration rate (comparison between conventional and conservation agriculture-based management).

Scale	Data collection
Randomized block design (4 replicates of 315 m2, six main cropping systems with plough, green manure and CA-based management)	• 2020 – 2022: SOC, N contents; bulk density; SOC & N stocks • 2021 and 2022: Biofunctool, C transformation, soil structure maintenance and nutrient cycling • 2021 – 2022: Biomass inputs, yields
On-farm network (from 6 to 10 farmers' fields)	• 2021: Biofunctool, C transformation, soil structure maintenance and nutrient cycling • 2021 and 2022: multiple form of ecosystem services (supporting, provisioning, regulating and non-marketed services) • 2021 – 2022: Biomass inputs, yields • Production costs, labor inputs, profitability



Outputs and key activities

Output 1: Depletion rate of SOC & N stocks from forest to arable lands
- Soil analysis under native vegetation soils
- Biomass assessment

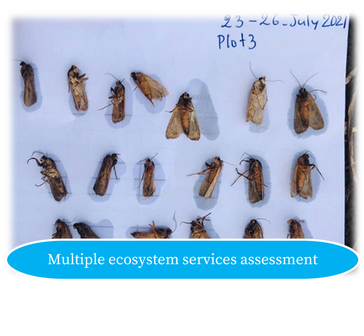
Output 2: Early changes in SOC and N stocks by comparing CT and CA (experiments)
- Experiments in Upland in Rattanak Mondoul (2 ha) for 3 years
- Diachronic soil samples chemical analysis (SOC, N, pH, bases)
- Running Biofunctool and soil biodiversity

Output 3: Productions of multiple ecosystems services assessed for conventional and conservation agriculture practice
- Select of farms (6-10)
- Gathering past farm's trajectories and economic status
- Assessment multiple ecosystem services

Output 4: Policy Dialogue
- National Workshop
- Peer-review

Implementation progress

Field operation



Density assessment

Key challenges and lessons leant

- **Covid-19**
  - In-person meeting cancelation
  - Training rescheduling
  - Sampling postponement
- **Land mine**
  - remaining explosive
- **Too much rain**
  - Soil sampling postponement
- **Limitation of laboratory analysis**
  - some soil parameters not be analyzed in Cambodia
- **Virtual meeting**
- **CA adaptation by farmers**

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