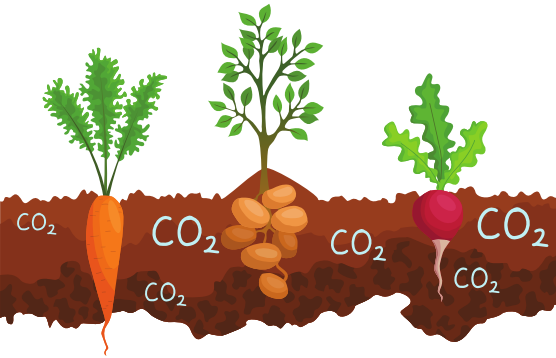


RESEARCH

Research on Investing into Soil Organic Carbon Management for Resilient Upland Farming (ISOC)



Land use change with the conversion of forests to agricultural lands, increase of the intensity of cultivation and use of chemicals, and decrease of crop diversity can lead to soil fertility depletion, land erosion, and biodiversity loss. In Cambodia, from 1996 to 2015, agricultural land increased by 19.6%, while forest cover decreased by 22% (Ingalls et al., 2018). Restoring soils by enhancing organic carbon content is a promising strategy for improving agricultural sustainability and aiding climate change mitigation and adaptation.

OBJECTIVES

This research aims to understand the impacts of conservation agriculture (CA) by assessing soil organic carbon (SOC) and ecosystem services, piloting a study in Battambang province, by:

- Assess the impact of land use change on SOC and nitrogen stocks;
- Quantify the impact of conventional plough-based management vs CA-based cropping systems on soil health;
- Assess the impacts on farms; and
- Feed policy dialogue.

RESEARCH METHODOLOGY



Experiment –Randomised block design (4 replicates of 315 m2, six main cropping systems with plough, green manure and CA-based management)



Different soil parameters analysis



Bio Function Toolbox is used to assess the functional quality of soils, particularly in relation to ecosystem services like carbon storage, nutrient cycling, and soil structure maintenance.



Analysis of the effect of the transition from conventional plough-based to CA-based management using some soil parameters sensitive to management practices: Permanganate Oxidizable Carbon (POXC) (labile carbon pool) and SituResp® (soil respiration).



Measurements over two years to capture the temporal evolution of the performances of the systems

CAMBODIA CLIMATE CHANGE ALLIANCE

Implemented by:



Funded by:





RESEARCH RESULTS



Land use change and the conversion of forests to agricultural lands (annual and perennial crops) harm SOC stock with a depletion that ranged from 31% to 69%



The Soil Quality Index (SQI) increased by 15% after 2 years of transition from Conventional Tillage (CT) to CA



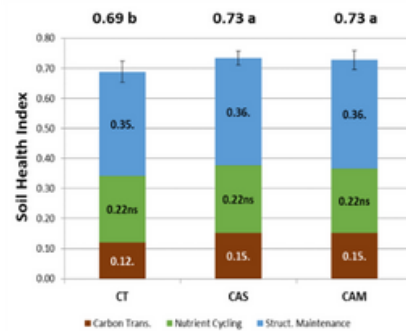
Involvement of 6 farms (2 women-lead)



Methods have been shared across a network of partners

CA Benefits

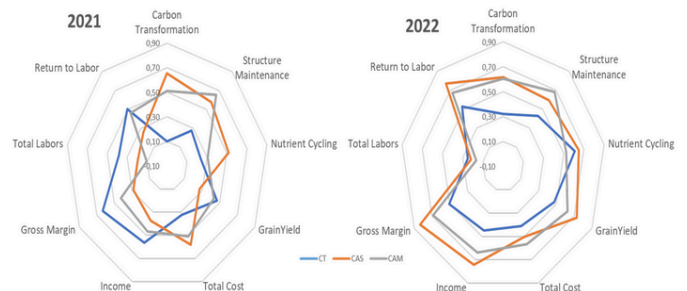
CA management offers several benefits, including increased earthworm density, which supports organic material decomposition, nutrient cycling, water infiltration, and stabilizes SOC. SOC levels under CA can double compared to conventional methods after five years, improving soil ecosystem functions and quality. CA also enhances soil microbial diversity and abundance, promoting soil health and reducing pests and diseases.



Impact of CT and two conservation agriculture systems—Conservation Agriculture System (CAS) and Conservation Agriculture Management (CAM)—on the soil quality index, based on carbon transformation, nutrient cycling, and soil structure maintenance.

Multi-criteria Assessment

In 2021, better soil health indicators were observed under CA systems, though the agro-economic performance was equal to or lower than that of CT. In 2022, both soil health indicators and agro-economic performance were higher under CA systems.



Comparison of Soil Health and Agro-Economic Performance under CA and CT Systems in 2021 and 2022



RECOMMENDATION

- **Long-Term Commitment:** Implement CA over extended periods to fully realize its benefits for soil health, crop productivity, and economic returns.
- **Tailored Approaches:** Develop CA strategies suited to specific soil types to maximize effectiveness.
- **Knowledge Dissemination and Capacity Building:** Promote CA through policy dialogues, field visits, and publications. Invest in training for farmers and extension workers to support effective adoption.
- **Investment in Analytical Facilities:** Equip with tools like carbon and nitrogen analysers to accurately measure greenhouse gas emissions and assess CA's impact.
- **Policy Support:** Advocate for policies offering financial incentives, technical assistance, and market access to encourage CA adoption.

CAMBODIA CLIMATE CHANGE ALLIANCE

Implemented by:



Funded by:

