



## **Soil Organic Carbon for Global Benefits – assessing potential SOC increase under SLM technologies worldwide and evaluating tradeoffs and gains of upscaling SLM technologies**

Bettina Wolfgramm (1), Hans Hurni (1), Hanspeter Liniger (1), Sebastian Ruppen (1), Eleanor Milne (2), Hans-Peter Bader (3), Ruth Scheidegger (3), Tadele Amare (4), Birru Yitaferu (4), Farrukh Nazarmavloev (1), Malgorzata Conder (1), Laura Ebnetter (1), Aslam Qadamov (5), Qobiljon Shokirov (1), Christian Hergarten (1), and Gudrun Schwilch (1)

(1) Centre for Development and Environment (CDE), University of Bern, Berne, Switzerland (bettina.wolfgramm@cde.unibe.ch), (2) Natural Resource Ecology Laboratory, Colorado State University, USA, (3) Systems Analysis, Integrated Assessment and Modelling, Swiss Federal Institute of Aquatic Science and Technology - Eawag, Dübendorf, Switzerland, (4) Soil and Water Research, Amhara Agricultural Research Institute (ARARI), BahirDar, Ethiopia, (5) Pamir Biology Institute, Tajik Academy of Agricultural Science, Khorog, Tajikistan

There is a fundamental mutual interest between enhancing soil organic carbon (SOC) in the world's soils and the objectives of the major global environmental conventions (UNFCCC, UNCBD, UNCCD). While there is evidence at the case study level that sustainable land management (SLM) technologies increase SOC stocks and SOC related benefits, there is no quantitative data available on the potential for increasing SOC benefits from different SLM technologies and especially from case studies in the developing countries, and a clear understanding of the trade-offs related to SLM up-scaling is missing.

This study aims at assessing the potential increase of SOC under SLM technologies worldwide, evaluating trade-offs and gains in up-scaling SLM for case studies in Tajikistan, Ethiopia and Switzerland. It makes use of the SLM technologies documented in the online database of the World Overview of Conservation Approaches and Technologies (WOCAT).

The study consists of three components:

- 1) Identifying SOC benefits contributing to the major global environmental issues for SLM technologies worldwide as documented in the WOCAT global database
- 2) Validation of SOC storage potentials and SOC benefit predictions for SLM technologies from the WOCAT database using results from existing comparative case studies at the plot level, using soil spectral libraries and standardized documentations of ecosystem service from the WOCAT database.
- 3) Understanding trade-offs and win-win scenarios of up-scaling SLM technologies from the plot to the household and landscape level using material flow analysis.

This study builds on the premise that the most promising way to increase benefits from land management is to consider already existing sustainable strategies. Such SLM technologies from all over the world documented are accessible in a standardized way in the WOCAT online database. The study thus evaluates SLM technologies from the WOCAT database by calculating the potential SOC storage increase and related benefits by comparing SOC estimates before-and-after establishment of the SLM technology. These results are validated using comparative case studies of plots with-and-without SLM technologies (existing SLM systems versus surrounding, degrading systems). In view of upscaling SLM technologies, it is crucial to understand tradeoffs and gains supporting or hindering the further spread. Systemic biomass management analysis using material flow analysis allows quantifying organic carbon flows and storages for different land management options at the household, but also at landscape level.

The study shows results relevant for science, policy and practice for accounting, monitoring and evaluating SOC related ecosystem services:

- A comprehensive methodology for SLM impact assessments allowing quantification of SOC storage and SOC related benefits under different SLM technologies, and
- Improved understanding of upscaling options for SLM technologies and tradeoffs as well as win-win oppor-

tunities for biomass management, SOC content increase, and ecosystem services improvement at the plot and household level.