EGU21-10562
https://doi.org/10.5194/egusphere-egu21-10562
EGU General Assembly 2021


# An adapted method to assess soil organic carbon stocks in a high mountain region: A LDN case study from Kirgistan

**Margarete Korintenberg**, Judith Walter, Katja Märten, and Jutta Zeitz
Humboldt University, Thaer-Institute of Agricultural and Horticultural Sciences, Department of Soil Science, Berlin, Germany (margarete.korintenberg.1@hu-berlin.de)

The Sustainable Development Goals (SDGs) adopetd by the United Nations in 2016 include the SDG 15.3 „Land Degradation Neutrality (LDN)“, which aims to reduce land degradation by national efforts of the member states. Three indicators for land degradation were gloablly identified: landcover, land productivity and soil organic carbon stocks (SOC). In particular, the assessment of SOC is challenging in countries where (a) spatial digital data is largely missing and (b) SOC mapping is difficult due to remotness typical for high mountain regions . Global data provided by the Secretariat of the United Nations Convention to Combat Desertification (UNCCD) may be used for reporting, but experience from various countries indicates inaccuracies due to generalisation. This is especially the case for SOC. Moreover, to report on changes in SOC stocks, a comprehensive baseline is mandatory. In order to approach these challenges, Kirgistan, which has signed the SDG's but still lacks a baseline for SOC, has been chosen for a case study.

In a multinational project we developed a scientifically based method to map and assess SOC stocks enabling a nationwide upscaling of SOC data (baseline). Using globally available data on landcover, elevation, climate and national soil data, „representative SOC units“ were identified prior to sampling. We assume that mainly these factors determine the spatial variability of SOC and that similar SOC stocks can be expected at comparable site conditions. More than 90% of the surface area, that potentially store SOC, is coverd by only 20 representative units, which were sampled 3-fold in the field. Sampling location within a single unit was determined using a drone to identify a representative location. Using the drone was especially helpful as sampling sites in a high mountain region were often extremely remote. During sampling small-scale variability of SOC was considered in the field. To determine SOC stocks, bulk density of the fine soil, coarse fragments and amount of roots were measured in the laboratory. Furthermore, pH, clay, silt and sand content were analysed to identify further drivers for SOC distribution.

Results show that spatial distribution of SOC in such a high mountain region is mainly controlled by landcover (cropland, grassland, forest), elevation, bulk density and clay content. Within single landcover classes topographic indices, such as aspect, further determine SOC distribution. This is especially the case for grassland, which is the dominant landcover in Kirgistan (53%). For the assessment of SOC stocks different approaches were compared. For instance, precise assessment of stocks using the bulk density of the fine soil corrected for coarse fragments leads to significantly

lower SOC stocks when compared to the global data provided by the UNCCD.