

Info Note

Enhancing Nationally Determined Contribution (NDC) ambition for soil organic carbon protection and sequestration

Liesl D. Wiese, Viridiana Alcántara-Shivapatham, Lini Wollenberg

JULY 2019

Key messages

- With only 10 countries currently referring to soil organic carbon (SOC) in their agricultural Nationally Determined Contribution (NDC) targets, there is a gap between ambition and potential for SOC targets.
- Current NDCs indicate that more than 40 countries have committed to practices relevant to SOC protection or sequestration, but have not specified SOC targets.
- Countries without SOC targets in their NDCs explain that the objective of SOC sequestration is i) secondary to that of enhancing agricultural production, ii) may be better suited to adaptation than mitigation targets, or iii) that the cost and difficulty of monitoring SOC is prohibitive.
- The UNFCCC process and national policy positions also require some countries to take political stances which may hinder direct SOC action.
- Despite these concerns, quantifying SOC-related NDC targets should be discussed as an opportunity for countries to leverage support for relevant national policies and technical capacity development, leverage access to climate finance, and increase transparency for global SOC accounting.
- If more countries are to set SOC targets, they require monitoring systems that are practical and cost-effective to better quantify and monitor SOC.

An estimated 18 to 37 billion tons of carbon could be sequestered in croplands globally over the next 20 years by implementing best practices for soil organic carbon

(SOC) sequestration (Zomer et al. 2017). In addition, more than 380 billion tons of carbon are at risk of loss from carbon dense peatlands in the top 20 countries with the largest peatland stocks alone (Crump 2017). SOC protection and sequestration are therefore **major greenhouse gas (GHG) mitigation options**, especially to contribute to the negative emissions needed to achieve the 2050 global policy targets. Increasing SOC levels can also provide substantial additional benefits for adaptation, food security and biodiversity, including nutrient cycling and water availability.

~10 countries refer to soil carbon in agricultural NDC targets.

~5 countries refer to soil carbon or organic matter without establishing specific agricultural SOC targets.

A number of countries specify agricultural mitigation targets for measures or practices relevant to soil carbon:

46 countries: manure management

41 countries: agricultural residue management

22 countries: restoration of degraded land, soil or forest

15 countries: agroforestry

9 countries: peatlands

Box 1: Soil carbon and related practices under agriculture in the NDCs. (Hönle et al. 2018; Richards et al. 2015)

Nationally Determined Contributions to the UNFCCC Paris Agreement provide a significant opportunity for countries to quantify SOC-related targets to support:

- The contribution of **national policy** to SOC targets;
- Relevant **technical capacity development**;
- Access to **climate finance**; and
- **Transparency** of global mitigation planning and accounting through the UNFCCC processes.

What

Only about 10 countries explicitly refer to soil carbon in their current agricultural NDC targets, however, a number of countries mention targets for other practices relevant to SOC, or refer to SOC without establishing a target (see Box 1.) (Hönle et al. 2018; Richards et al. 2015, 2016). According to the Intergovernmental Panel on Climate Change (IPCC) guidance for emissions reporting, GHG accounting should be transparent, complete, consistent, comparable, and accurate (TCCCA). While NDCs do not need to be consistent with IPCC accounting standards, which include SOC as one of the carbon pools to be reported by countries, better alignment with these principles would improve global planning and finance for climate action. There is thus a need to consider whether and how countries should specify SOC protection- and sequestration-related agricultural mitigation and adaptation targets in their NDCs. Most countries have existing national policies, programs and practices relevant to enhancing SOC.

Who

The storage potential of SOC differs among countries based on environmental conditions, soil properties, land use systems and historical carbon loss. Countries with large cropland areas, in agroecological zones favourable

to SOC formation, or with high historical SOC losses, have high potential to sequester SOC, while countries with large areas of wetlands, peatlands and other carbon dense soils have significant potential to protect SOC and prevent GHG emissions. Figure 1 shows the 10 countries currently holding more than 60% of the global SOC stock at 30 cm according to FAO and ITPS (2018). Figure 2 shows the top 10 countries with the potential to sequester the highest total amounts of SOC in croplands over 20 years and the top 10 countries with the largest peat carbon stocks to be protected. Five countries (Brazil, Canada, China, Russian Federation, and United States of America) fall under the top 10 in both categories.

How

Proven on-the-ground technical options for avoiding loss of soil carbon pools are widely available, for example, avoided drainage of organic soils in wetlands and peatlands. Similarly, a number of measures can help sequester soil carbon. Examples of such practices in the NDCs with SOC related agricultural targets are agroforestry, reduced or no-till farming, maintaining soil cover, using cover crops, composting, applying organic amendments, and restoring wetlands and peatlands.

As soil carbon stocks are influenced by multiple factors related to land use, environmental factors and management, and the impacts of practices will vary. Economic constraints pose the main barrier to the implementation of SOC sequestration measures in terms of providing financial implementation incentives and reducing the economic risk of changes in land use and management.

Countries specifying measures relevant to SOC protection and sequestration in their NDCs, but yet without linking them to SOC-related targets, have the potential to quantify SOC targets in updated NDCs.

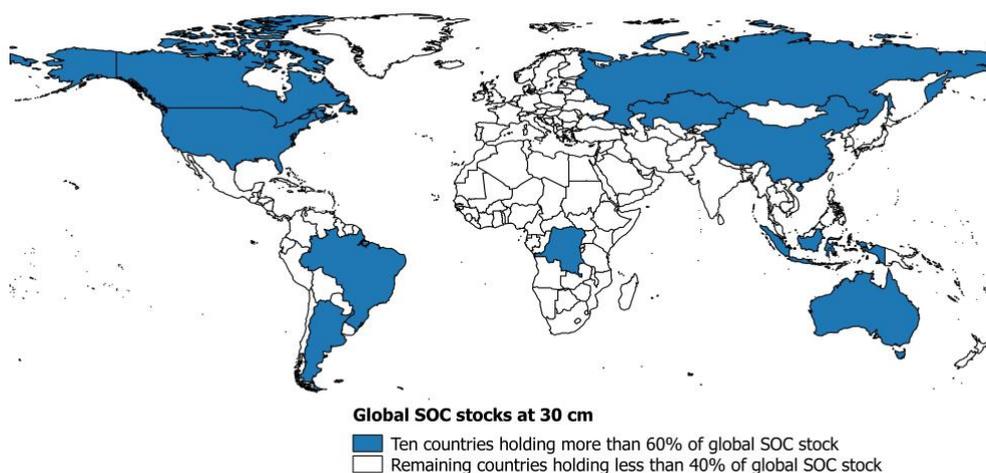


Figure 1 Map of the 10 countries currently holding more than 60% of the global SOC stock at 30 cm according to FAO and ITPS (2018).

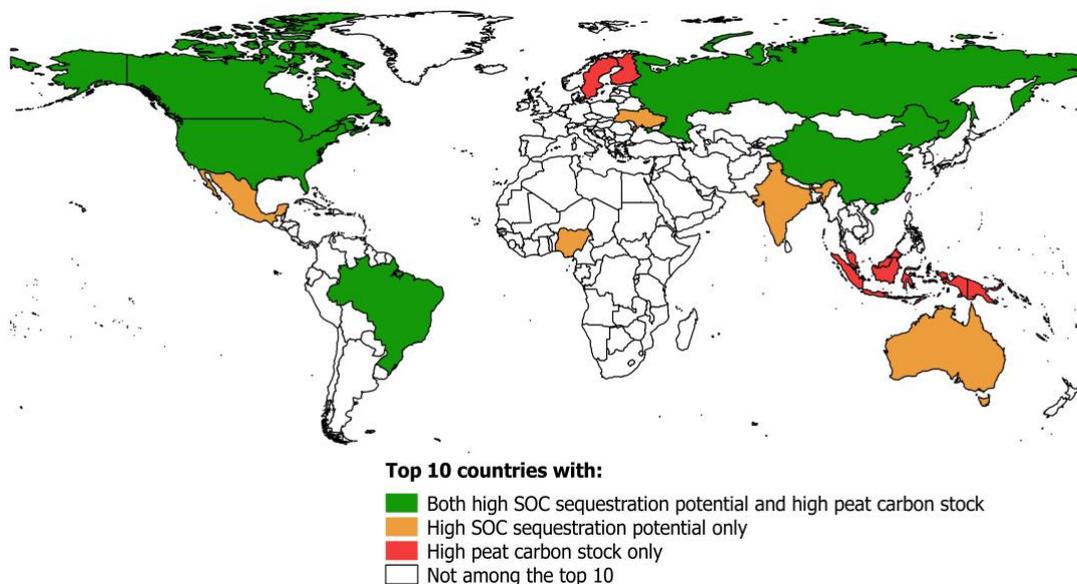


Figure 2 Map of the top 10 countries with the potential to sequester the highest amount of SOC in croplands per country over 20 years according to Zomer et al. (2017) and the largest peat carbon stocks per country according to Crump (2017).

Challenges

Countries currently do not quantify and monitor SOC sequestration targets for several reasons. For some countries, the primary challenge is the practicality and cost of monitoring SOC (direct measurement, modelling, and activity data) to estimate changes in soil carbon stocks. Improving SOC inventories further requires enhanced national capacity to gather relevant activity data to develop country-specific emission factors and SOC targets. For others, the challenge is that SOC sequestration is a secondary national policy objective compared to enhancing agricultural production or that SOC practices are seen as better suited in the NDCs for adaptation than mitigation targets. The UNFCCC process and national policy positions also require some countries to take political stances which may hinder direct SOC action.

Recommendations

To support ambition in SOC protection and sequestration targets, and transparent means for tracking goals, countries are encouraged to consider the following recommendations when revising their NDCs:

1. Develop a soil carbon target

- Assess the significance and feasibility of SOC protection and sequestration as major GHG mitigation measures with large co-benefits for adaptation and food security, relative to other mitigation and adaptation options available in your country.

- Clearly specify the SOC protection and sequestration potential of relevant mitigation measures currently listed in the NDCs based on current science.
- Quantify practical mitigation targets for SOC protection and sequestration based on the implementation of relevant mitigation measures currently specified in the NDCs to enhance transparency.
- Ensure comprehensive stakeholder engagement (including the private sector) in NDC target setting related to integrated soil management.

2. Link national efforts to NDCs

- Collaborate with parties to exchange sound science, policy solutions and technical expertise to support the inclusion of SOC protection and sequestration targets in NDCs and to develop feasible implementation strategies.
- Review relevant national policies, programs and practices, including at subnational level, to support policy coherence and alignment with the NDCs and Sustainable Development Goals.
- Support long-term SOC sequestration targets through coherent national policies and investment strategies to remove barriers to SOC sequestration implementation actions.

Regardless of whether countries set SOC targets for the NDCs, supporting SOC action and global monitoring of this is important for agriculture and the climate alike. Closing the gap between current ambition and the global

biophysical potential of SOC protection and sequestration will require concerted action. Whether countries decide to take such action formally within the UNFCCC process may be secondary to making sure it happens at all.

Further reading

- Crump J. 2017. Smoke on water - Countering global threats from peatland loss and degradation. A UNEP Rapid Response Assessment. United Nations Environment Programme and GRID-Arendal, Nairobi and Arendal.
- FAO, ITPS. 2018. Global Soil Organic Carbon Map (GSOCmap). Technical report. Rome, Italy.
- Hönle SE, Heidecke C, Osterburg B. 2018. Climate change mitigation strategies for agriculture: an analysis of nationally determined contributions, biennial reports and biennial update reports. *Clim. Policy* 3062:1–15.
- Richards M, Bruun T, Campbell B, Gregersen L, Huyer S, Kuntze V, Madsen S, Oldvig M, Vasileiou I. 2016. How countries plan to address agricultural adaptation and mitigation: An analysis of Intended Nationally Determined Contributions. CCAFS dataset version 1.2. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
- Richards M, Bruun TB, Campbell BM, Gregersen LE, Huyer S, Kuntze V, Madsen STN, Oldvig MB, Vasileiou I. 2015. How countries plan to address agricultural adaptation and mitigation: An analysis of Intended Nationally Determined Contributions. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
- Zomer RJ, Bossio DA, Sommer R, Verchot LV. 2017. Global Sequestration Potential of Increased Organic Carbon in Cropland Soils. *Sci. Rep.* 7:1–26.

The information on SOC in the NDCs presented here is based on an analysis of existing studies of the Intentionally Determined Contributions (INDCs) and NDCs. The analysis was supplemented by interviews with experts from selected countries and discussed during a side event in June 2019 at the Bonn Climate Change Conference (SB50). The side event agenda and presentations can be found at: <https://ccafs.cgiar.org/ccafs-sb50-enhancing-ndc-ambition-through-soil-organic-carbon-sequestration#XSQbVi2ZPEY>

Liesl D. Wiese (liesl.wiese76@gmail.com) is an International Consultant working on soil, land, agriculture and policy-related aspects of sustainable development, based in Stellenbosch, South Africa.

Viridiana Alcántara-Shivapatham is a member of the 4 per 1000 Executive Secretariat based at the Federal Office for Agriculture and Food in Bonn, Germany.

Lini Wollenberg is the Flagship Leader for the Low Emissions Development at CCAFS, based at the University of Vermont.

This project was funded by Vanguard Charitable, with assistance from Betsy Taylor, Breakthrough Strategies and Solutions; the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS); and supported by the 4 per 1000 Soil Initiative.

About CCAFS Info Notes

CCAFS Info Notes are brief reports on interim research results. They are not necessarily peer reviewed. Please contact the authors for additional information on their research.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) brings together some of the world's best researchers in agricultural science, development research, climate science and Earth system science, to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security. Visit us online at <https://ccafs.cgiar.org>.

CCAFS is led by the International Center for Tropical Agriculture (CIAT) and supported by:

