

FAO contribution to the Nature Based Solutions workstream for the Climate Action Summit

Recarbonization of Global Soils

A facility for implementing the Koronivia Joint Work on Agriculture (KJWA) with focus on agricultural and degraded soils

1. Context and rationale:

As part of a natural process, healthy soils store large quantities of carbon (C) in the form of soil organic carbon (SOC). Through stabilization mechanisms in soil organic matter (SOM), the SOC contained therein can remain stored in the soil for thousands of years.¹ Soils constitute the largest terrestrial carbon pool: an estimated total of 2,344 Gt C,² more than the sum of carbon contained in the atmosphere and vegetation.³ Soils perform crucial functions in the global carbon balance and recognition of the importance of soils and their sustainable management for addressing climate change adaptation and mitigation is increasing. Recent discussions under the Koronivia Joint Work on Agriculture (KJWA) particularly highlighted the positive role of soils for climate change adaptation and mitigation, agriculture and food security. There exists substantial scientific and practical evidence of how sustainable soil management (SSM) can provide multiple benefits for the environment, people and livelihoods. SSM preserves and increases SOM, a key element of soil health, which regulates many soil functions, including carbon storage in the form of SOC⁴. In this way, SSM supports the retention and enhancement of carbon stocks in soils and thus climate change mitigation, while generating benefits for agriculture, food security and nutrition, provision of ecosystem services, climate change adaptation, and advancing multiple sustainable development goals (SDGs). Investing in SSM constitutes a cost-effective and feasible climate change mitigation option, which, at the same time, enhances soil health and climate resilience.

2. An overview of the contribution:

RECSOIL, the Recarbonization of Global Soils, constitutes an implementing facility for scaling up SOC-centred SSM, based on collaborative efforts under the Global Soil Partnership (GSP). The main priorities of RECSOIL and associated multiple benefits are: a) to prevent further SOC losses from carbon rich soils (peatlands, black soils and permafrost) and, where feasible, to increase SOC stocks; b) enhance farmer's income through increase of soil productivity; and c) contribute to food security and nutrition. RECSOIL will focus on agricultural and degraded soils. The facility will support the provision of incentives to farmers who agree to implement SOC-centred SSM practices. One of the facility's central funding mechanisms will be voluntary carbon credits, technically backed up by other RECSOIL components such as the Global Soil Organic Carbon Monitoring Network.

¹ U. Stockmann, et al. 2013. The knowns, known unknowns and unknowns of sequestration of soil organic carbon. *Agric. Ecosyst. Environ.*, 164, pp. 80-99. <https://www.sciencedirect.com/science/article/pii/S0167880912003635?via%3DIihub>

² 1 Gt (gigatonne) = 10¹⁵ g = 1 petagram = 1 billion tonnes

³ Ciais, et al. 2013. Carbon and Other Biogeochemical Cycles. In T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex & P.M. Midgley, eds. *The physical science basis. Contribution of working group I to the fifth assessment report of the intergovernmental panel on climate change*, pp. 465–570. Cambridge, United Kingdom and New York, NY, USA, Cambridge University Press. http://www.ipcc.ch/report/ar5/wg1/docs/review/WG1AR5_SOD_Ch06_All_Final.pdf%5Chttp://ebooks.cambridge.org/ref/id/CBO9781107415324A023

⁴ FAO & ITPS. 2015. *The Status of the World's Soil Resources (Main Report)*. 648 p. p. (Also available at <https://hal.archives-ouvertes.fr/hal-01241064/>)

3. How the contribution leverages living natural systems as a solution to avert climate change?

As part of a natural process, a healthy soil can store for long periods of time the carbon that plants absorbed from the atmosphere through photosynthesis. SOC-centred SSM can enhance this natural process and support the recarbonization of soils by building up and stabilizing SOC stocks in soils, thus avoiding emissions and sequestering additional carbon from the atmosphere.

4. How might the contribution support both climate, mitigation and adaptation as well as other important co-benefits and social, economic and environmental outcomes in coming years including:

Reduction in carbon emission and carbon capture (GTonnes)

The world's soils represent the largest pool of carbon on land, with an estimated stock of 680 Gt C in the first thirty centimetres⁵ of soil (of which 147 Gt C corresponds to cropland), 1,500 Gt C in the first meter and 2,344 Gt C in the first three meters⁶ (more than the sum of the carbon contained in the atmosphere and vegetation). Despite its considerable stock, the world's cultivated soils have historically lost between 50 and 70 % of their original carbon stock (approximately 135 Gt C since the 19th century to date), which has been released into the atmosphere in form of CO₂, mainly due to unsustainable soil and land management practices. The carbon sequestration capacity of the world's agricultural and degraded soils is approximately 2.95 Gt C per year⁷.

Increasing climate resilience

Soil organic carbon contributes to the storage, availability and cycling of plant nutrients; soil biodiversity; soil porosity, aeration, water-holding capacity and hydraulic conductivity; thermal properties; and mechanical strength. All these functional properties contribute to: enhance fertility, productivity and yields; increase quality of food, water retention, erosion prevention, filtration and denaturing of pollutants; increase resilience to droughts, floods and land degradation; and ultimately improve the overall climate resilience of agroecosystems and farmers' livelihoods as well as farmers' adaptive capacity.

Social impact (job increase; poverty reduction, etc.)

The implementation of RECSOIL will directly contribute to poverty reduction, job increase and involving youth in agriculture. SOC-centred SSM includes innovative tools and approaches that enhance soil productivity, increase crop yields and yield stability in time, and enhance food quality (especially by increasing micronutrient content). This provides more opportunities for marketing at higher prices and improves access to food and food security, in particular for smallholder farmers. RECSOIL will also bring degraded lands into production, thus opening job opportunities in marginal livelihoods. Youth will be attracted by providing them with opportunities for accessing technological SSM developments, technical support and targeted financial incentives to boost SSM and agriculture.

Net economic impact (total in US\$; how was it achieved?)

In 2016, carbon offsets in the forestry and land use sector accounted for the highest share of total value in the voluntary offset market (46% of a total US\$191.3M). Due to their social and environmental co-

⁵ FAO and ITPS. 2018. Global Soil Organic Carbon Map (GSOCmap) Technical Report. Rome. 162 pp. (Also available at:

<http://www.fao.org/global-soil-partnership/pillars-action/4-information-and-data-new/global-soil-organic-carbon-gsoc-map/en/>)

⁶ Jobbágy, E.G. & Jackson, R.B. 2000. The vertical distribution of soil organic carbon and its relation to climate and vegetation. *Ecological Applications*, 10(2): 423–436. [https://doi.org/10.1890/1051-0761\(2000\)010\[0423:TVDOSO\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2000)010[0423:TVDOSO]2.0.CO;2)

⁷ Lal, R. 2017. 2018. Digging deeper: A holistic perspective of factors affecting soil organic carbon sequestration in agroecosystems. *Glob Change Biol.* 1–17. (Also available at: <https://doi.org/10.1111/gcb.14054>)

benefits, they sold at a relatively high average price (US\$5/t CO₂e), even higher for offsets in grassland/rangeland management projects (US\$7/t CO₂e), which specifically account for SOC.⁸ Based on the average price for grassland/rangeland management offsets and a carbon sequestration capacity of the world's agricultural and degraded soils of about 1 -2 Gt C/year, investment through RECSOIL could generate an estimated US\$25-50 billion per year, just in carbon offset revenue.⁹ If accounting for the biodiversity, climate resilience, water and food security benefits, this value would be significantly higher. The economic benefits through business opportunities in the restoration of degraded lands have been estimated at US\$70-85/year by the year 2030.¹⁰

The cost to accelerate soil carbon sequestration to this level can be reduced by coordinating and enhancing synergies with existing initiatives, for example on land degradation neutrality, climate-smart agriculture, rural development, biodiversity and watershed protection, being funded by governments, companies and NGOs, and by ensuring that farmers receive an integrated support package that assures sustained adoption of best practices.

Impact on realization of the 2030 Agenda for Sustainable Development

RECSOIL constitutes a direct contribution to the achievement of the SDGs as soil is functional to various SDGs.

- SDG 1: No poverty – enhancing soil health/SOC content increases agricultural productivity thus improving farmers' incomes.
- SDG 2: Zero Hunger – adopting SSM increases food production in both quantity and quality (especially micronutrients).
- SDG 3: Good health and wellbeing – SSM addresses the issue of soil pollution, which is crucial for SOC sequestration and especially soil and human health.
- SDG 6: Clean water and sanitation – SSM enhances the capacity of soils to filter and store water, thus contributing to improved access to and quality of water.
- SDG 12: Responsible consumption and production – SSM enhances natural soil fertility, thus reducing the use of fertilizers, and soils' capacity of denaturing of pollutants, thus reducing their persistence in the environment.
- SDG 13: Climate action – SOC-centred SSM greatly contributes to both climate change mitigation and adaptation.
- SDG 15: Life on land – SOC-centred SSM is a key tool for achieving land degradation neutrality.

Just transition

Through technical support and incentives for the adoption of SOC-centred SSM, RECSOIL will enable farmers, including smallholders and managers of degraded or marginal lands, to improve their livelihoods and incomes while contributing to the transition to a low-carbon and climate-resilient economy.

⁸ Ecosystem Marketplace. 2017. Unlocking Potential: State of the voluntary carbon markets 2017. Available at: https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

⁹ 1 Gt C = 3.664 Gt CO₂e

¹⁰ AlphaBeta. 2016. Valuing the SDG prize in Food and Agriculture: Unlocking business opportunities to accelerate sustainable and inclusive growth. Business and Sustainable Development Commission (BSDC) contributing paper. Available at: <http://businesscommission.org/our-work/valuing-the-sdg-prize-in-food-and-agriculture>.

Food security

Food security and nutrition are at the core of RECSOIL. By implementing SOC-centred SSM, crop yields can be increased and maintained at a stable level, the nutrient content of crops is improved and the denaturing of pollutants enhanced, thus contributing to improve food security, nutrition and food safety.

Minimising species extinction and ecological losses and fostering an increase of biodiversity.

SSM seeks to enhance soil biodiversity, as it contributes greatly to the formation of SOM from organic litter, thereby increasing the SOC content. A high content and quality of SOM, in turn, favours high numbers and activity of soil biota that interact with plant roots.

5. Countries and organisations involved in the contribution:

The GSP and its 9 Regional Soil Partnerships, composed of all FAO member countries plus more than 500 other partners (including academia, civil society, private sector and NGOs), are part of this contribution as they are committed to the promotion of SOC-centred SSM.

6. Consultation of stakeholders:

RECSOIL is the result of a collaborative consultation process that the GSP has maintained since 2012. Regional Implementation Plans were developed by member countries and partners identifying priorities and actions. SSM is at the core of these priorities and countries and partners are working on implementing the actions. However, there is a need to scale up action in order to achieve a substantial impact.

7. Where can the contribution be put into action?

The contribution could be implemented in all ecosystems of the world, although this contribution is specifically focused on agricultural land and degraded soils. Good SSM practices are local context-specific and over the years, the GSP has documented a number of sound practices for different agroecological zones to prevent emissions from SOC and sequester more SOC.

8. Implementation system, stakeholder engagement and transformational impacts:

RECSOIL will be implemented following an inclusive approach in which different stakeholders will have a role to play. Various components (global SOC monitoring system, guidelines for measuring, mapping, reporting and monitoring SOC, etc.) will work at global, regional and national level. Governments will be involved especially in the implementation of RECSOIL as a delivery mechanism of commitments in their Nationally Determined Contributions (NDCs) and the development of normative and measuring tools. Farmers are the key actors and beneficiaries making RECSOIL happen on the ground. They will receive technical support for adopting SOC-centred SSM good practices. The RECSOIL facility will engage directly with farmer associations to create incentive schemes, avoiding the bureaucracy observed in many other existing schemes. This implementation system will enable broad adoption of good SOC-centred SSM practices and substantial positive impacts on climate change mitigation efforts and multiple co-benefits, verified by credible monitoring mechanisms.

9. Contribution to other Climate Action Summit work streams:

Due to the cross-sectoral nature of soils, RECSOIL directly contributes to other streams, especially climate finance and carbon pricing, resilience and adaptation and mitigation strategy.

10. Examples of experiences to date:

There are many examples of successful implementation of SOC-centred SSM in various countries. For example, an FAO-project promoted Quesungual, a climate-smart agroforestry system, in Honduras, which successfully transformed soils, landscape, and the livelihoods and incomes of farmers.¹¹ Furthermore, recent experiences by Australia's Carbon Farming Initiative, American Carbon Registry, and many others are demonstrating that providing incentives to farmers whose lands have potential for SOC sequestration could make a substantial contribution to global efforts on climate change mitigation.¹²

11. Mechanisms for funding

Despite the potential of SOC sequestration, lacking investments in SSM are still a major constraint to take action to scale. In order to address this challenge, RECSOIL will establish an incentives scheme, to mobilize voluntary contributions, especially private funding from voluntary carbon offsets and blended investments in climate change mitigation and adaptation.

In order to avoid the bureaucracy observed in many other existing finance schemes, the RECSOIL facility will provide access to a user-friendly incentive scheme for farmers to implement SOC-centred SSM for climate change mitigation and adaptation and associated multiple benefits.

12. Means of stewardship, metrics for monitoring:

RECSOIL implementation and impacts will be monitored through the country-driven Global Soil Organic Carbon Monitoring System, guided by the Guidelines for Measuring, Mapping, Reporting and Monitoring SOC Changes. Considering that SOC sequestration occurs in different timeframes, two different variables will be used for measuring SOC in the field and the laboratory: a) Short-term changes of the labile SOC pool, every year; and b) Medium-term changes of the passive SOC pool, every 5 years. The laboratory measurements will be guided through Standard Operating Procedures of the Global Soil Laboratory Network (GLOSOLAN). Noting the different multiple benefits of SOC-centred SSM, other variables will be also measured including: crop yield, micronutrient content of food, soil biodiversity, bulk density and water infiltration.

13. Communication strategy:

Awareness raising is a key part of RECSOIL to inform different stakeholders about the importance and benefits of investing in and adopting SOC-centred SSM. This includes governments who are currently preparing their NDCs, as RECSOIL will particularly support those countries whose NDCs include SOC and soils in their mitigation and adaptation strategies and link to the KJWA. All the channels already established by the Global Soil Partnership will be utilized and enhanced to reach key stakeholders and partners.

14. Contact details of proponents:

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¹¹ FAO. 2015. The Quesungual System: changing lives in Honduras | FAO [online]. [Cited 14 April 2019]. <http://www.fao.org/soils-2015/news/news-detail/en/c/318676/>

¹² See Figure 9: Market Volume and Value by Standard, 2016 in https://www.forest-trends.org/wp-content/uploads/2017/07/doc_5591.pdf

