



# SOIL USE AND AGRICULTURAL PRACTICE IN AFRICA

## IMPACTS ON SOIL CARBON

Brief for decision-makers  
and agricultural negotiators

### BOOSTING KORONOVIA

This brief provides a summary of key points from the book *Land use and agricultural practices in Africa: Impacts on soil carbon* (available in French only) co-published by the CaSA network (Soil Carbon for Sustainable Development in Africa) and the Food and Agriculture Organization of the United Nations (FAO). The book is a contribution to the Koronivia Joint Work on Agriculture (KJWA) and gives an overview of soil health and carbon sequestration across Africa, providing examples of best practices.

#### **Soil: an essential resource that must be preserved**

Soil is a vital resource for both agricultural production (food, fibres, biomass) and food security.

Soil provides essential ecosystem services (water filtration, biodiversity preservation and carbon storage).

As an essential carbon reservoir, soil has a fundamental role in mitigating the increasing concentration of greenhouse gases.

Soil is central to the Sustainable Development Goals (SDGs), in particular SDG 2 “Zero Hunger”, SDG 13 “Climate Action”, SDG 15 “Life on Land”, SDG 12 “Sustainable Consumption and Production” and SDG 1 “End Poverty”.

#### **Definitions**

Soil organic carbon is the result of the decomposition of organic matter, essentially plants. It is estimated that soils hold three times as much carbon as the Earth’s atmosphere.

Soil carbon stocks refer to the measure of carbon at a given time for a given area and depth, expressed in tonnes of carbon per hectare.

Carbon storage is an assessment of the variations in stocks over time or following a change of land use or agricultural practice. Evaluating storage for a particular practice corresponds to estimating the additional carbon sequestration in comparison to a standard practice.

# AFRICAN SOILS: A RESOURCE UNDER PRESSURE

- The percentage of degraded soils, excluding unproductive land (deserts, salt plains, lakes and mountainous areas) is estimated at 22 percent of the continent's surface area<sup>1</sup>.
- Soil degradation is essentially caused by deforestation, overgrazing and unsustainable agricultural practices.
- Soil degradation is exacerbated by population increase, extreme climate events or inappropriate irrigation.
- Soil degradation is visible through the phenomena of erosion, acidification and salinization and by large losses in carbon, nutrients and biodiversity.

## STATISTICS

### African demography

- 1.3 billion inhabitants in 2020
- x 2 by 2050
- x 4 by 2100

### Agricultural activity

- 20% of African GDP
- 60% of employment

### African soils

- 13% of the world's arable land
- 154.6 gigatonnes of carbon

## RECOMMENDATIONS

Increased carbon sequestration is possible although it varies depending on agricultural practices.

There is no single solution to restore soil and preserve or increase carbon stocks.

**The CaSA's recommendations are structured around four key areas of work.** Some of these overlap with recommendations made by the African Group of Negotiators as part of the KJWA process:

1. **Collect data and knowledge on agricultural practices and carbon stocks in soils.**
2. **Support research and dialogue among stakeholders.**
3. **Provide a favourable political framework for the implementation of sustainable practices.**
4. **Ensure international funding to support project implementation.**

## Submission of the African Group of Negotiators (AGN) for Agriculture to topic 2(c)<sup>2</sup> of the Koronivia Joint Work on Agriculture.

1. Undertake soil carbon (organic and mineral) mapping that is useful and accessible to farmers.
2. Develop a framework and guidance for the long-term assessment of soil carbon, soil fertility and soil health trends in different agricultural systems.
3. Develop a framework and guidance to address water scarcity and water use.
4. Enhance support to developing countries to facilitate their access to financial resources, technologies and capacity building in order to improve the implementation of Nationally Determined Contributions (NDCs) and National Adaptation Plans.

# DETAILS OF THE CASA NETWORK'S RECOMMENDATIONS

 The icon shows recommendations overlapping with AGN.

## KNOWLEDGE AND DATA

- Identify and outline the overall diversity of agricultural production systems and inventorize agricultural practices and their impacts on carbon, both positive and negative, in order to inform public policy.
- Improve harmonization and standardization of measuring methods and data collection.
- Create and share georeferenced databases.
- Gain better understanding of the legal aspects of data in the context of open science.
- Set up and maintain mid to long term observatories.

**FOCUS** - Acquire, harmonize and share more African data

It is more important than ever to document and provide figures on current stocks and the true potential of African soils for stocking carbon. The lack of data and the scarcity of long-term studies in Africa mean that carbon dynamics in tropical soils are poorly predicted or not predicted at all.

The CaSA network book highlights the difficulty of data analysis due to the existence of different soil classifications. Scientists are strongly encouraged to recommend the standardization of soil description, sampling methods, analysis and reporting of collected data.

Today, efforts to create shared databases and efforts to harmonize or standardize data collection exist in order to improve the quality and representativeness of data. Databases on soil resources and on the types of land tenure and land management need to be developed. Establishing soil monitoring systems in all countries should be a long-term commitment in order to identify the variability of carbon stocks on different scales and increase visibility of African data.

## RESEARCH

- Support African research in producing data, including training technical staff.
- Consider systems that integrate livestock farming and agriculture to favour transfer of organic matter (OM).
- Consider links between water management and OM management.
- Encourage research between sectors (forestry, agriculture and livestock farming).
- Encourage links between theory and practice, among researchers, Non-Governmental Organizations (NGOs), agricultural advisors and farmers.
- Encourage participatory research (research/civil society).
- Provide inventories and support producers and agricultural stakeholders who promote the agroecological transition.

**FOCUS** - Raise awareness about the study of carbon soil stocks by opening it up to different scientific disciplines

Knowledge of soil carbon stocks and their dynamics is part of a complex socio-environmental system involving diverse stakeholders.

Finding solutions for the different possibilities and methods of stocking carbon in soil, their quantification, possible risks and

co-benefits depends on the involvement of diverse scientific disciplines and stakeholders. The answers to these questions can vary, since the specificities of African territories are numerous and diverse.

## POLITICAL PROCESSES

- Encourage governments to put in place:
  - policies to improve land tenure security,
  - necessary infrastructure for agriculture,
  - access to credits to implement sequestration practices,
  - incentives for investment in agriculture and for farmers.
- Encourage governments to engage in:
  -  processes of discussion and international negotiations (e.g. KJWA),
  -  their national commitments (NDCs, National Adaptation Plans, national strategies, etc.)
- Encourage governments to support research on these issues

**FOCUS** - Promote the integration of soil carbon in agricultural soils into national climate plans

It is urgent for governments to put policies in place to support stakeholders on the issue of soil carbon. Dialogues with all stakeholders from different agricultural sectors (producers, farmer organizations, agricultural advisors, data collectors, retailers and consumers) is vital to avoid a simplified view of the synergy between ecological intensification of agriculture and adaptation/mitigation of climate change.

It is essential (i) that these challenges are taken into account and included in the preparation and implementation of NDCs and, (ii) that the specificities and constraints of the African continent

as well as the sustainable restoration practices described in the work, are discussed within the framework of the KJWA. Indeed, the vast majority of African countries' NDCs propose actions in the land sector (AFOLU<sup>3</sup>) to both mitigate and adapt to climate change. However, few countries specify the concrete and quantified actions they plan to take to reduce greenhouse gas emissions or stock carbon<sup>4</sup>. Due to the lack of knowledge of carbon stocks and storage potential in agricultural soils, it is estimated that AFOLU sector emission reductions will probably represent less than 20 percent of emission reductions in the NDCs by 2030<sup>5</sup>, and will only concern ten percent of the Green Climate Fund budget<sup>6</sup>.

## FUNDING

- Develop funding through private or international funds.

## The CaSA network – Soil Carbon for Sustainable Agriculture in Africa



The CaSA network brings together predominantly French-speaking researchers, soil scientists, ecologists and agronomists, from Africa and France. Supported by the French Ministry of Foreign Affairs and the *Institut de Recherche pour le Développement* (IRD) since 2013, the CaSA network is the result of a collaboration between African and European researchers committed to the study and promotion of soil carbon. The CaSA network is led by five research teams from Africa and Madagascar and the IRD. It consists of 21 research teams from 11 French-speaking African countries.

The objective of the network is to promote soil issues and sustainability in agricultural production in Africa. The network's research contributes (i) to understanding, quantifying and modelling the potential for carbon sequestration in soils according to their uses, (ii) to understanding the distribution and dynamics of carbon stocks in soils and (iii) to promoting the importance of this soil health indicator in agricultural production and climate issues.

CaSA research results provide a rich foundation for international discussions. The book coordinated by the network, *Land use and agricultural practices in Africa: Impacts on soil carbon*, presents an overview of the level of knowledge of carbon stocks in agricultural soils and is a contribution to the Koronivia Joint Work on Agriculture (KJWA).

The network also organizes workshops, training courses and conferences, and produces awareness-raising videos. For its members, the network provides an ideal space for scientific exchanges and knowledge sharing (validation, international recognition). It also provides training and develops tools to improve the exchange of information between scientists, politicians and civil society.

**For more information about CaSA visit:** [www.reseau-carbone-sol-afrique.org](http://www.reseau-carbone-sol-afrique.org)

## REFERENCES

<sup>1</sup> Jones A., Breuning-Madsen H., Brossard M., Dampha A., Deckers J., Dewitte O., Gallali T., Hallett S., Jones R., Kilasara M., Le Roux P., Micheli E., Montanarella L., Spaargaren O., Thiombiano L., Van Ranst E., Yemefack M., Zougmore R., (eds), 2013. Soil Atlas of Africa. Luxemburg, European Commission, Publications Office of the European Union, 176 pp. <https://esdac.jrc.ec.europa.eu/content/soil-map-soil-atlas-africa>

<sup>2</sup> Theme 2(c): Improvement of soil carbon, soil health and fertility in grazing and cropland systems as well as integrated systems including water resource management. Downloadable at: <https://www4.unfccc.int/sites/SubmissionsStaging/Documents/201906101641--AGN%20KJWA%20submission%20on%20topics%20b%20and%20c.pdf>

<sup>3</sup> Land sector or "Agriculture, foresterie et autres utilisations des terres" or "Agriculture, Forestry and Other Land Use" in English and known as AFOLU.

<sup>4</sup> FAO, 2016. The Agriculture Sectors in the Intended Nationally Determined Contributions: Analysis. Rome, FAO, 92 pp. Downloadable at: [www.fao.org/3/a-i5687e.pdf](http://www.fao.org/3/a-i5687e.pdf)

<sup>5</sup> Forsell N., Turkovska O., Gusti M., Obersteiner M., Elzen M., Havlik P., 2016. Assessing the INDC's land use, land use change, and forest emission projections. Carbon Balance and Management, 11, 26. DOI: 10.1186/s13021-016-0068-3

<sup>6</sup> FAO, 2018. A preliminary review of agriculture-related activities in the Green Climate Fund portfolio. 6 pp. Downloadable at: [www.fao.org/3/CA2698EN/ca2698en.pdf](http://www.fao.org/3/CA2698EN/ca2698en.pdf)

## CONTACTS

Tantely Razafimbelo, Université d'Antananarivo, Laboratoire des radio-isotopes:  
[tantely.razafimbelo@gmail.com](mailto:tantely.razafimbelo@gmail.com)

Tiphaine Chevallier, IRD, Unité Mixte de Recherche Eco&Sols:  
[tiphaine.chevallier@ird.fr](mailto:tiphaine.chevallier@ird.fr)

Produced with the support of



Food and Agriculture  
Organization of the  
United Nations



Federal Ministry  
of Food  
and Agriculture