COP 28 UAE SIDE EVENT

NATURAL CARBON SEQUESTATION:

LEVERAGING SOILS FOR MITIGATION, STORAGE & BIODIVERSITY BENEFITS

10 December 2023

Speakers

DR. JACQUELINE HANNAM

President, British Society of Soil Science

JAMES COOKE

Land Sustainability Team Lead at the Welsh Government

DR. LEIGH ANN WINOWIECKI

Global Research Lead for Soil & Land Health at CIFOR-ICRAF & Co-Founder of CA4SH (Coalition of Action 4 Soil Health)

KAREN ROSS

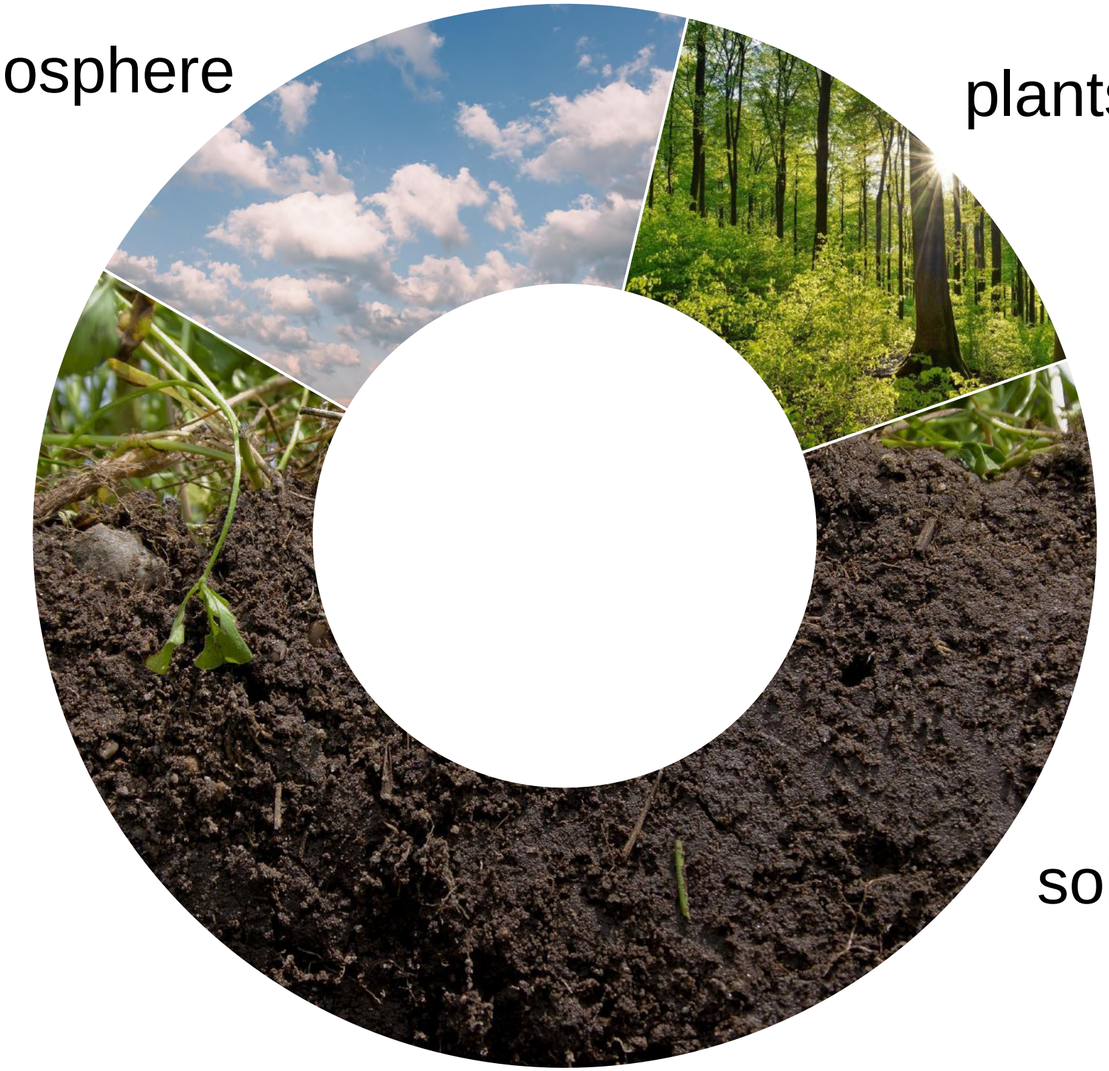
Secretary
California Department of Food & Agriculture

Natural carbon sequestration (NCS):

Leveraging soils for mitigation, storage & biodiversity benefits

BRITISH SOCIETY OF SOIL SCIENCE

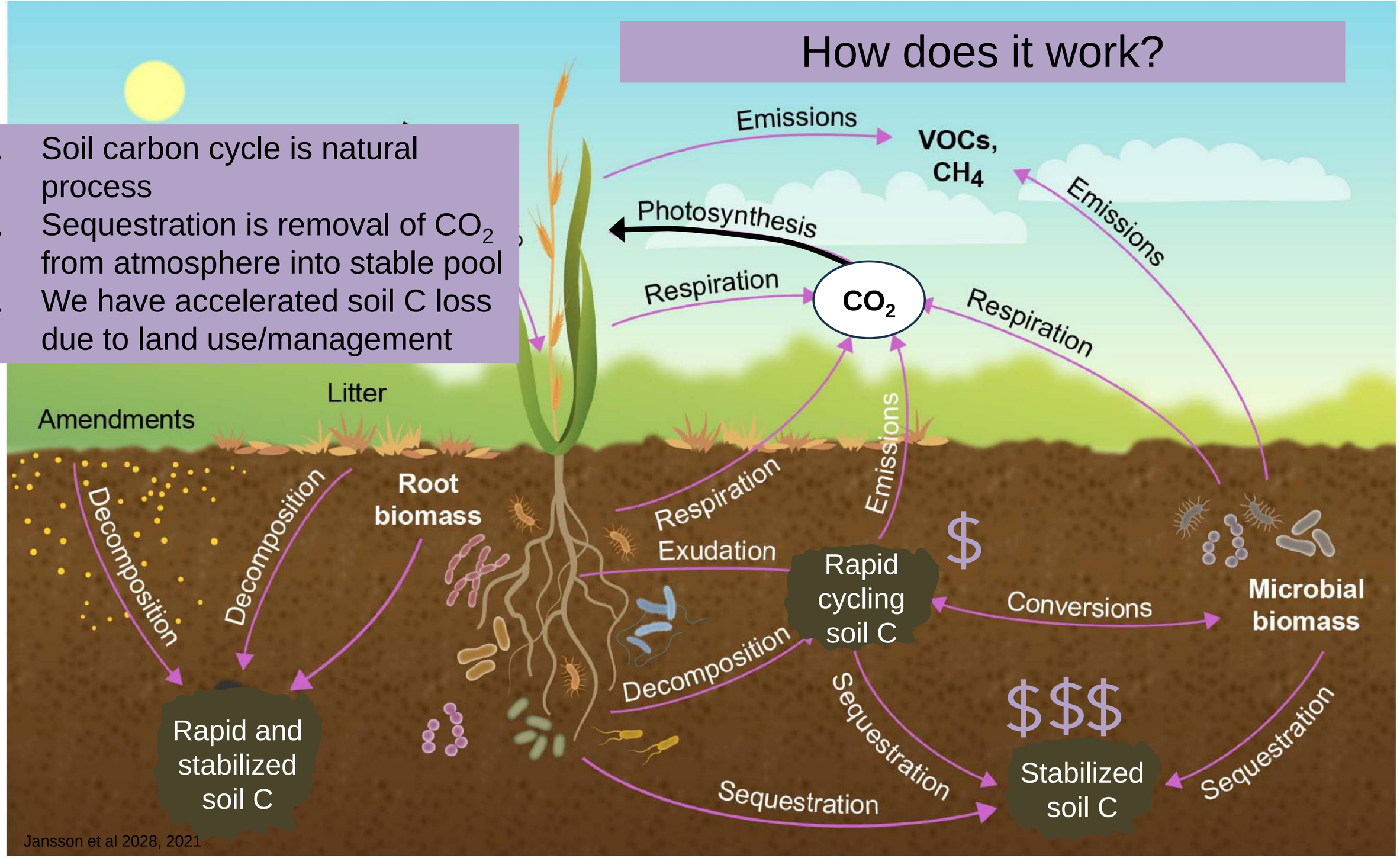
Carbon stocks: more carbon in soil than in the atmosphere and plants combined



Additional sequestration potential is estimated at 2 to 5 Gt CO_2 per year =
roughly equivalent to India or USA annual emissions

How does it work?

1. Soil carbon cycle is natural process
2. Sequestration is removal of CO_2 from atmosphere into stable pool
3. We have accelerated soil C loss due to land use/management



Jansson et al 2028, 2021


Photo: Gateway Research Organisation

How do we do it?

- Land use change
- Changes in farming practices (regenerative agriculture/ agroecology)
- Protecting and restoring large soil carbon stocks (forests/peatland)

What are the challenges?

- Land use trade-offs
- Monitoring, verification reporting
- Incentives for change / financing

Pic; European Union

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Summer 2022 – Eroded Bog Prior to Restoration

October 2022 – Rewetted Bog Following Restoration Activity

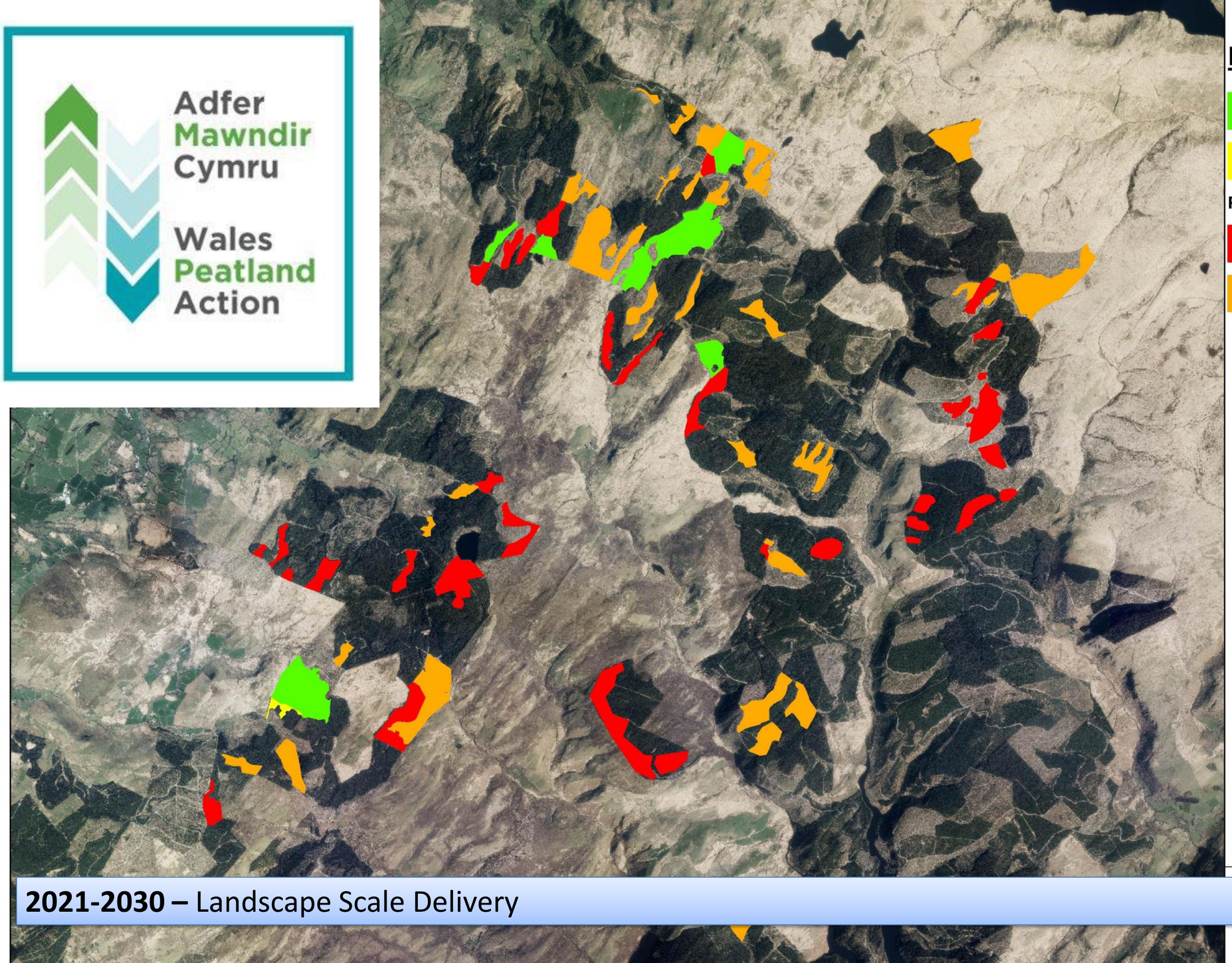
Llywodraeth Cymru
Welsh Government

Cyfoeth Naturiol Cymru
Natural Resources Wales

September 2023 – Recovery

Adfer Mawndir Cymru

Wales Peatland Action



Legend

- scrub_and_hydrological_work_complete_v3
- scrub_completed_awaits_hydrological_work

Peatland sites from forest resource plan

- Long-Term Bog Restoration
- Short-term Bog Restoration

171 hectares, completed (green)
Out of 967 hectares mapped for peatland restoration

Llywodraeth Cymru
Welsh Government

Cyfoeth Naturiol Cymru
Natural Resources Wales

Please note, sites ilisted as part of the layer named "peatland sites from forest resource plan" have not yet been confirmed, the FRP process is ongoing.Sites named as long term restoration requires forest harvesting. Short term are available for restoration upon completion of the current FRP.

2021-2030 – Landscape Scale Delivery

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CIFOR-ICRAF

Healthy Soils, Healthy People, Healthy Planet

Leigh Ann Winowiecki
Global Research Lead of Soil and Land Health, CIFOR-ICRAF

CIFOR 30 YEARS

World Agroforestry

Global Landscapes Forum

Resilient Landscapes

Healthy soil is central for ecosystem restoration, climate change mitigation and adaptation, and food and nutrition security.

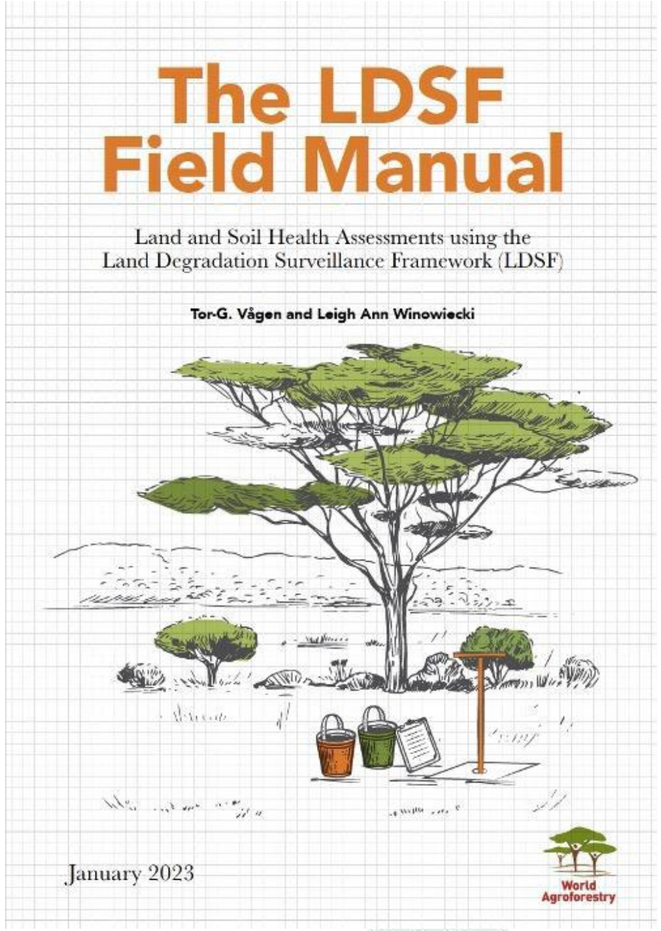
BUSINESS AS USUAL IS NOT AN OPTION. TARGETED INVESTMENTS IN LANDSCAPE RESTORATION - FROM the SOIL UP ARE URGENTLY NEEDED - AND THEY NEED TO BE PRIORITIZED, BASED ON SCIENCE AND FARMER CENTERED

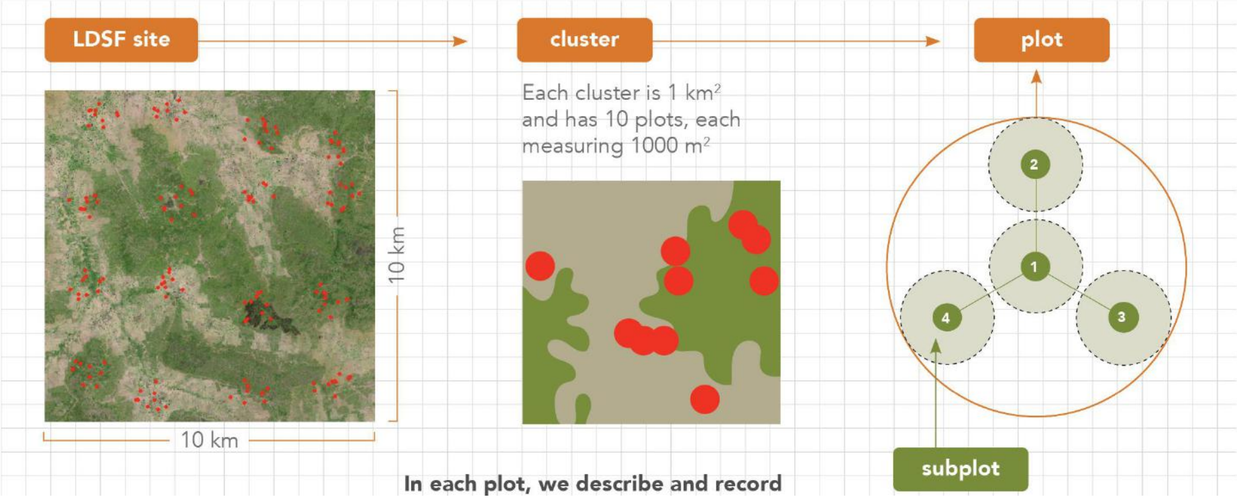
Soil Degradation negatively impacts 3.2 billion people, globally (GLO2, 2022; IPBES, 2018)

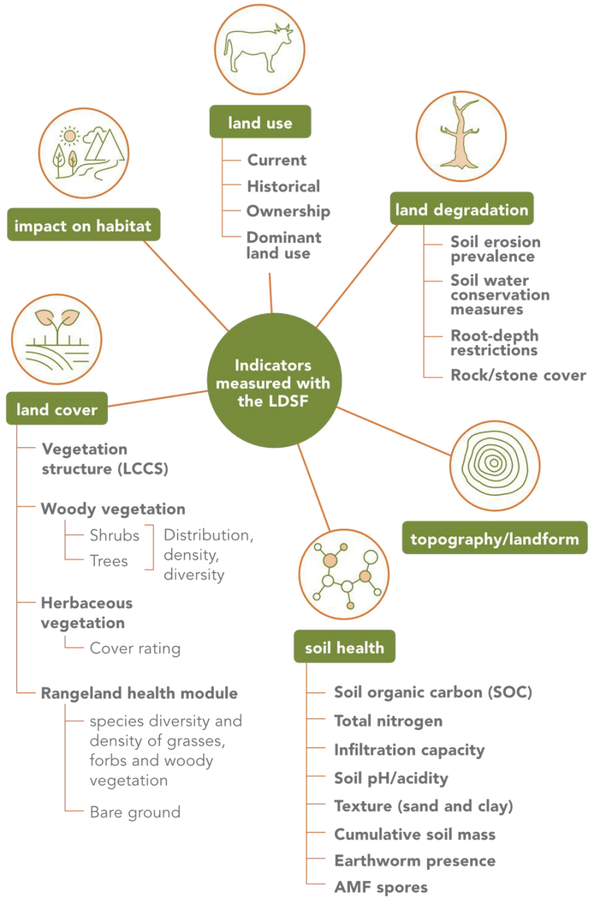
Soil erosion is the most widespread form of degradation


Landscapes are diverse!
A monitoring framework will need to assess multiple indicators and their variability.

The Land Degradation Surveillance Framework (LDSF)







Systematic, hierarchical sampling design enables robust assessments

Online: https://www.cifor-icraf.org/knowledge/publication/25533

Multiple indicators: incl. above and belowground biodiversity

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A data-driven network to assess and monitor soil health, land degradation and vegetation diversity and dynamics

- Consistently applied across projects
- Over 250-100km^2 sites
- Enables statistical comparisons across land uses
- Production of accurate predictive maps

LDSF field manual: https://www.cifor-icraf.org/knowledge/publication/25533

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CGIAR RESEARCH PROGRAM ON Forests, Trees and Agroforestry

Global Landscapes Forum

Resilient Landscapes

The CIFOR-ICRAF Soil and Land Health Laboratories

- Leading global lab for robust, cost-efficient and rapid analysis of soil, plants and inputs using spectroscopy.
- Analysing 30,000 soil samples annually
- Over 200,000 geo-referenced samples barcoded in our physical archive
- Now combined with soil biological analysis

https://www.cifor-icraf.org/research/theme/soil-and-land-health/

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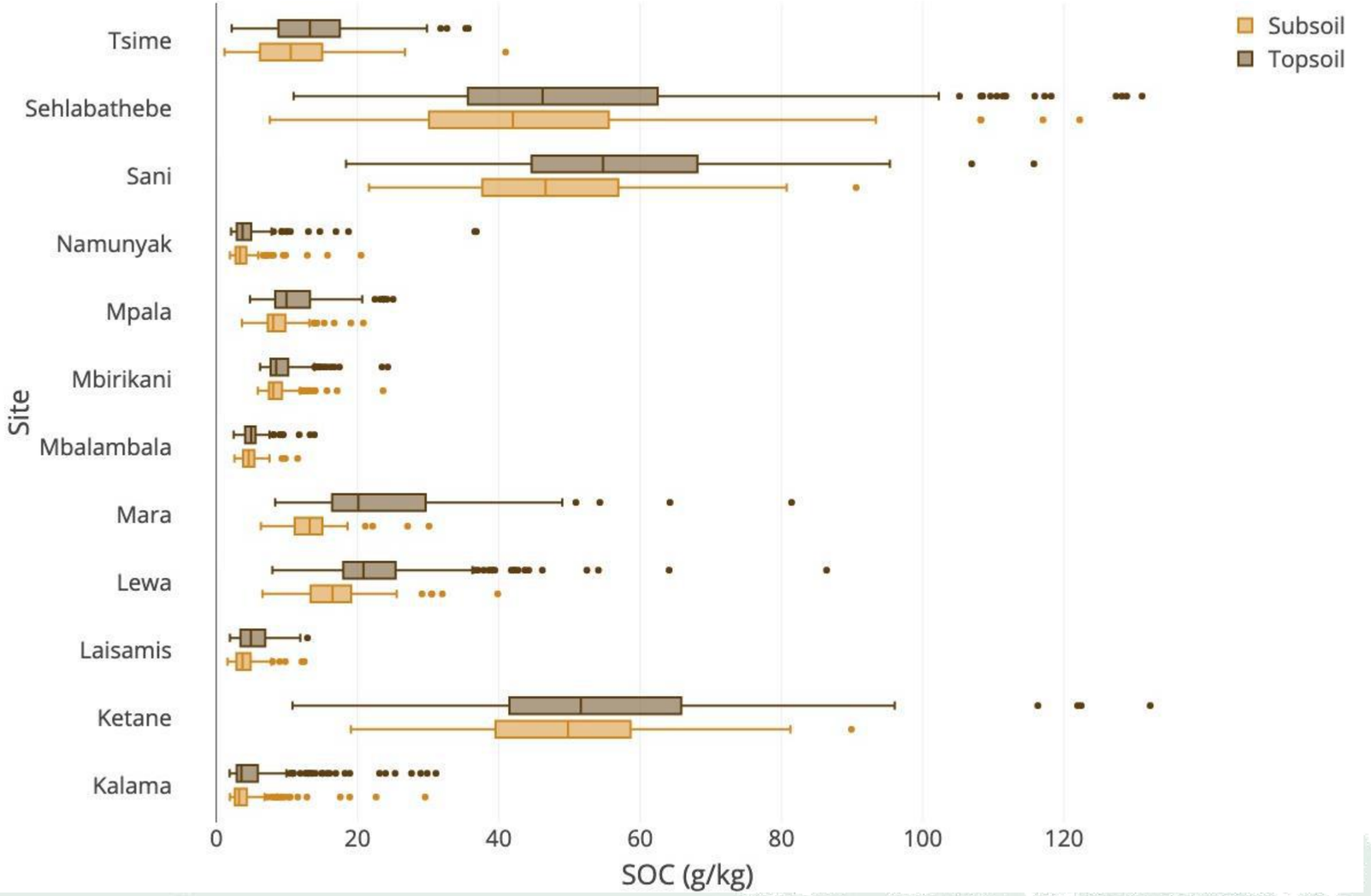
LDSF Soil Organic Carbon Results across Rangeland LDSF Sites in East and Southern Africa

Landscape photo of the Sani LDSF site in Lesotho. Credit: DRRM



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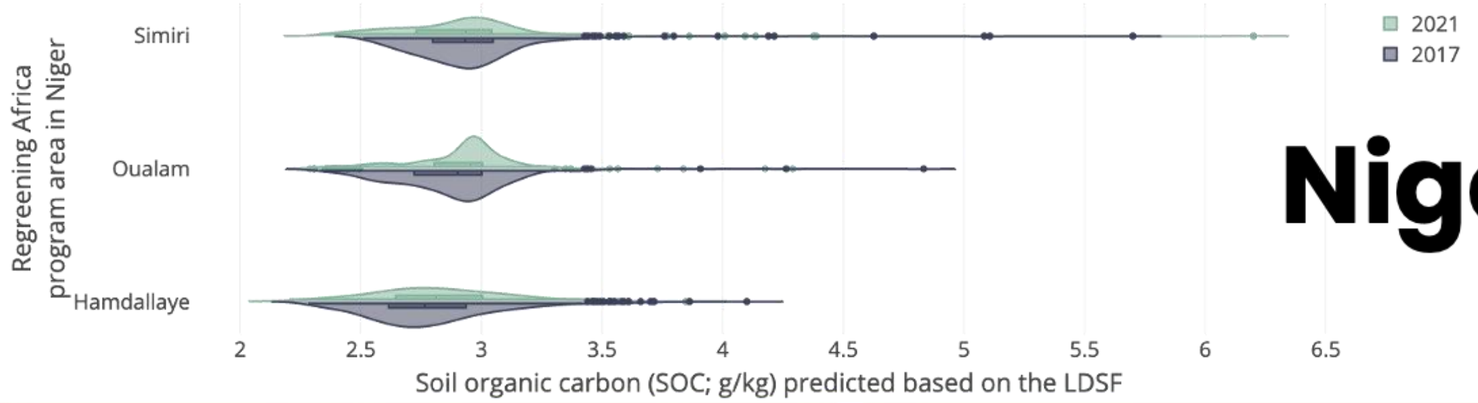
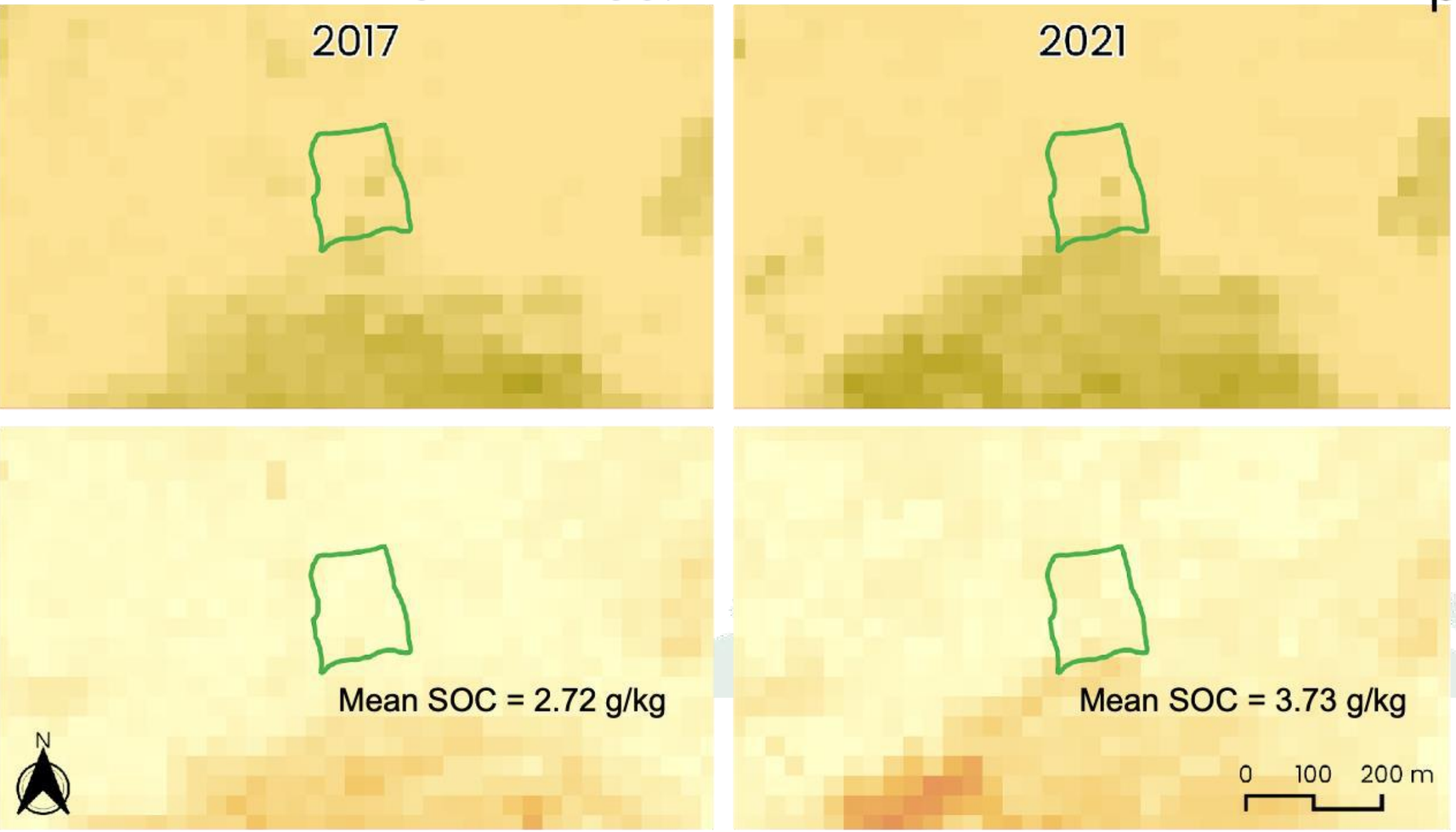
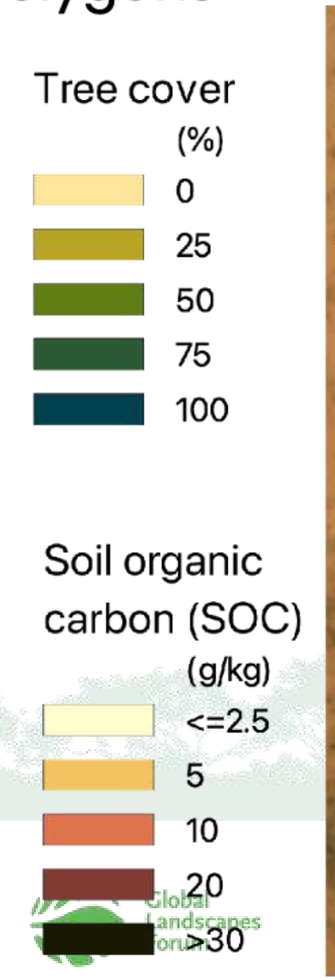
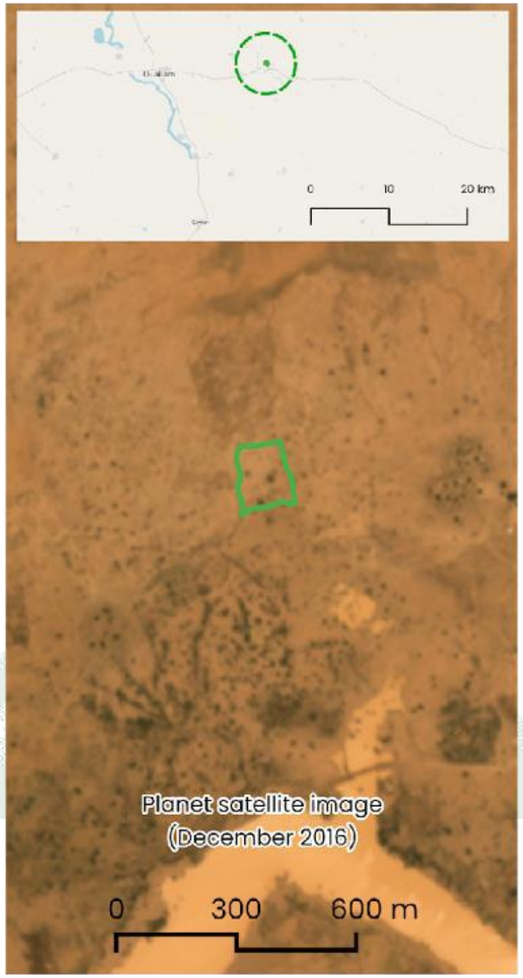


Niger

- Using the LDSF-based models we can map and monitor changes in **vegetation and SOC** even in very marginal areas.
- Combined with the farm polygons







Examples of the multi-dimensional benefits of soil health

Influence of soil organic carbon on crop yields, globally.

nature geoscience

Article

https://doi.org/10.1038/s41561-023-01302-3

Global crop production increase by soil organic carbon

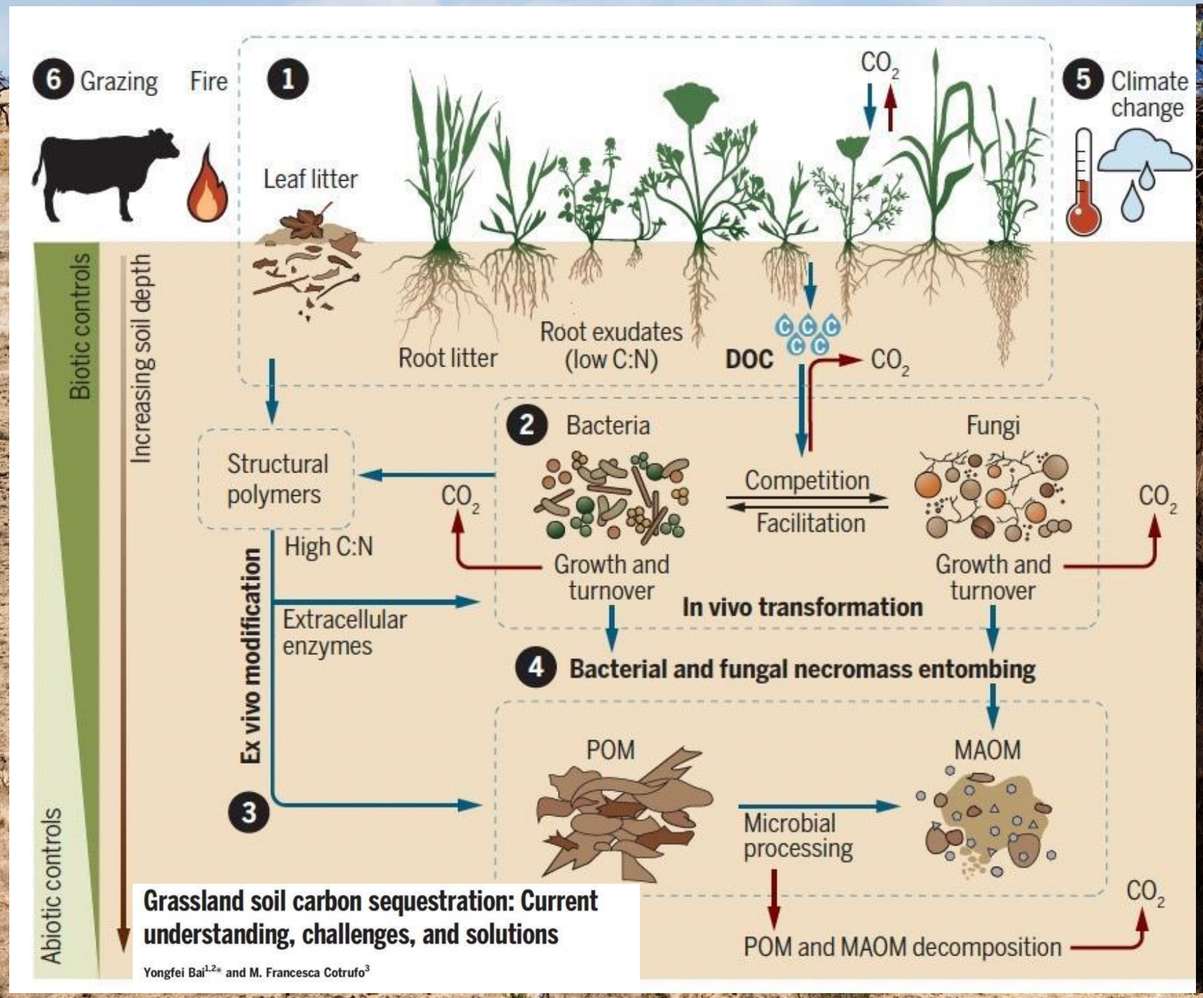
Received: 17 April 2023

Accepted: 21 September 2023

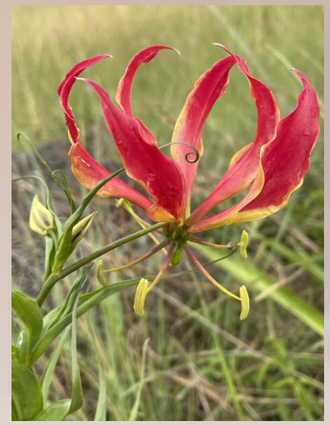
Yuqing Ma[1,2,7], Dominic Woolf[2,3,4,7], Mingsheng Fan[1] ✉, Lei Qiao[5], Rong Li[6] & Johannes Lehmann[2,3,4] ✉

On average, crop yields increased with SOC and levelled off as SOC approaches a threshold level, confirming the existence of an optimum SOC concentration (~20 g kg-1).

Grasslands Store One Third of the Global Terrestrial Carbon Stocks



Plant Diversity and Soil Carbon in Grasslands



nature communications

Article

https://doi.org/10.1038/s41467-023-42340-0

The positive effect of plant diversity on soil carbon depends on climate

Received: 16 May 2023

Accepted: 6 October 2023

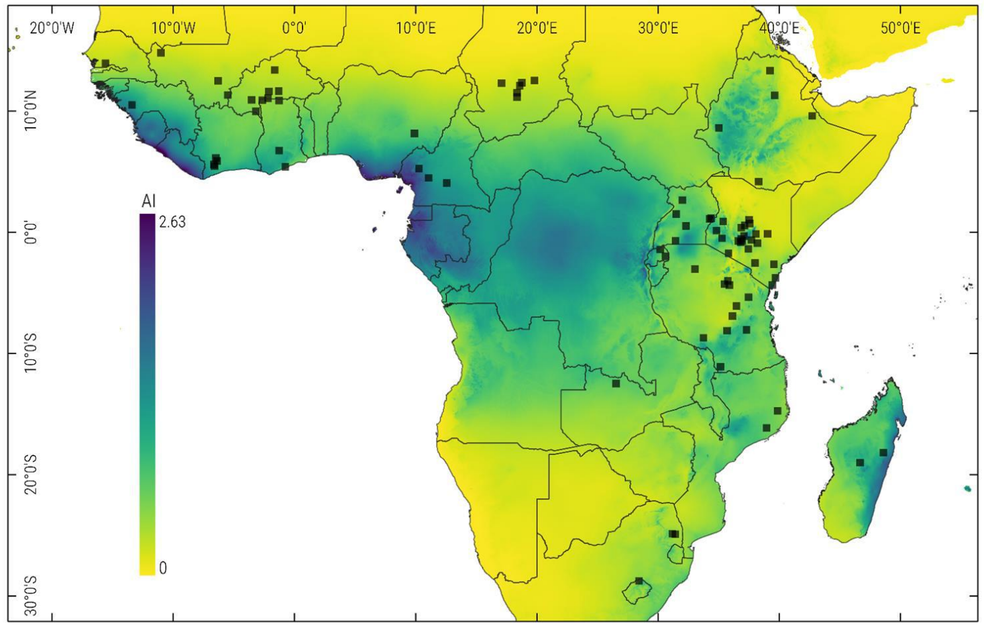
Published online: 19 October 2023

Check for updates

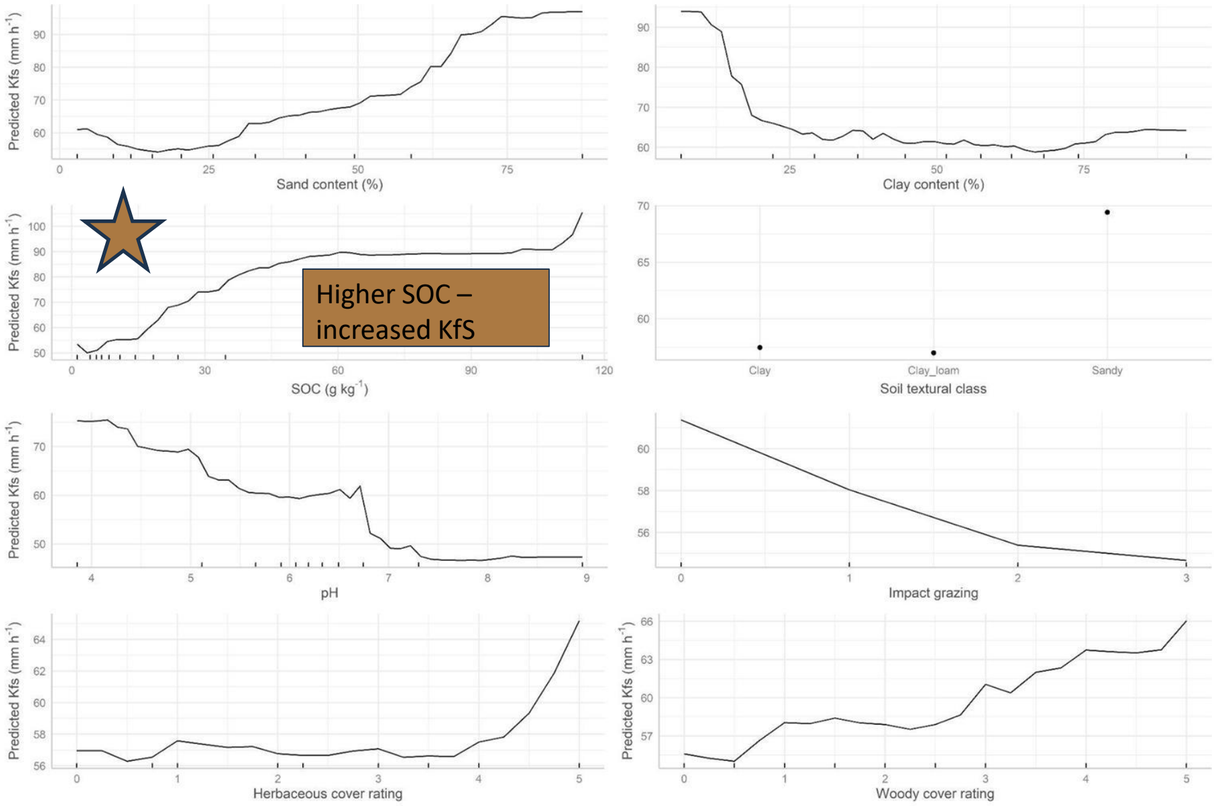
Marie Spohn[1], Sumanta Bagchi[2], Lori A. Biederman[3], Elizabeth T. Borer[4], Kari Anne Bråthen[5], Miguel N. Bugalho[6], Maria C. Caldeira[7], Jane A. Catford[8,9], Scott L. Collins[10], Nico Eisenhauer[11,12], Nicole Hagenah[13], Sylvia Haider[11,14,15], Yann Hautier[16], Johannes M. H. Knops[17], Sally E. Koerner[18], Lauri Laanisto[19], Ylva Lekberg[20], Jason P. Martina[21], Holly Martinson[22], Rebecca L. McCulley[23], Pablo L. Peri[24], Petr Macek[25], Sally A. Power[26], Anita C. Risch[27], Christiane Roscher[11,28], Eric W. Seabloom[4], Carly Stevens[29], G. F. (Ciska) Veen[30], Risto Virtanen[31] & Laura Yahdjian[32]

Plant diversity is positively correlated with soil carbon content and soil carbon-to-nitrogen ratio across 84 grasslands on six continents that span wide climate gradients.

Determinants of soil field-saturated hydraulic conductivity across sub-Saharan Africa



3573 plots from 83 LDSF sites across 19 countries



Partial dependence plots showing the marginal effect of **8 model covariates on the predicted field-saturated hydraulic conductivity (Kfs**) using a Random Forest regression model.

Bargués-Tobella, A., Winowiecki, L.A., Sheil, D. and Vågen, T.G. *Under review.* Determinants of soil field-saturated hydraulic conductivity across sub-Saharan Africa: texture and beyond.

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Thank you

Leigh Ann Winowiecki L.A.Winowiecki@cifor-icraf.org

cifor-icraf.org | globallandscapesforum.org | resilient-landscapes.org

CIFOR-ICRAF harnesses the power of trees, forests, and agroforestry landscapes to address the most pressing global challenges of our time – biodiversity loss, climate change, food security, livelihoods and inequity.

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CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California & Healthy Soils

California Climate Policies: Soil Health

CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

- Scoping Plan
  - Pathway to carbon neutrality (includes healthy soils practices target of 78,000 acres per year, 8,000 acres of permanent conservation)
- Executive Order on Biodiversity N-82-20
  - Includes soil biodiversity -> belowground biodiversity report, NWL Climate Smart Strategy, Farmer and Rancher-Led Climate Change Solutions
- AB 1757
  - Nature-based solutions for natural carbon sequestration (includes healthy soils acreage targets)

California Department of Food and Agriculture - Healthy Soils Program

- Incentives to Farmers and Ranchers to implement healthy soils practices such as cover cropping, compost application, mulching, hedgerows, etc.
- These practices sequester carbon, increase organic matter, reduce erosion, increases soil's ability to hold water, and improve air and water quality
- Also includes Demonstration Program for research and demonstration purposes: new experimental practices, university research, farmer peer-to peer learning days

Healthy Soils Program – Investments to Date

cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

- Have provided $125.5 Million in grants since 2014
- Investments include more than 1,500 projects covering 130,000 acres
- Estimated 1.1 MMTCO2e sequestered over lifespan of projects
- Equivalent to removing 240,000 cars from the road each year
- Five percent of funding has gone to technical assistance
- At least 25% of funding goes to socially disadvantaged farmers and ranchers

Q & A

THANK YOU!

INVEST IN SOIL

CASE STUDY EXPLORER

The BSSS Invest in Soil project aims raise awareness of the importance of soil internationally, across all sectors, showcasing the positive impact which good soil management has. Click on the orange markers on the map to find more information on the specific case studies.

https://soils.org.uk/investinsoil