Food and Agriculture Organization of the United Nations

RECSOIL: The initiative and country experiences

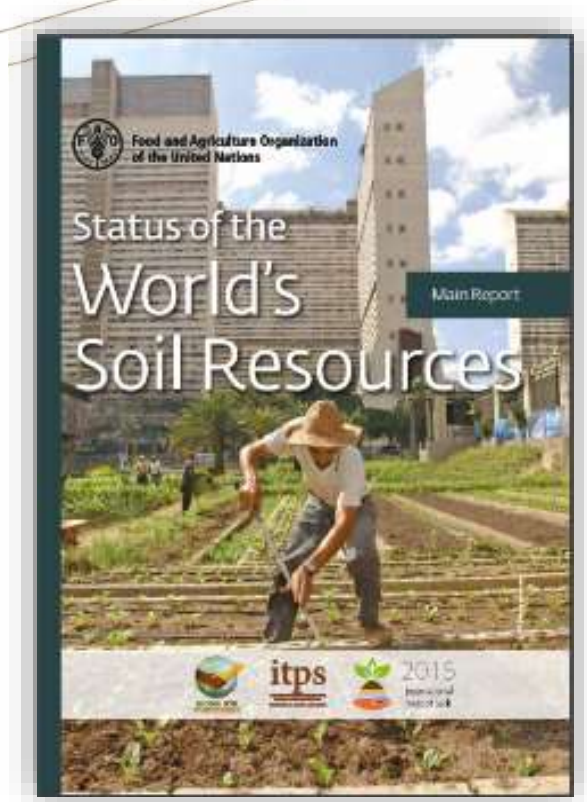
Lydiah Gatere, RECSOIL

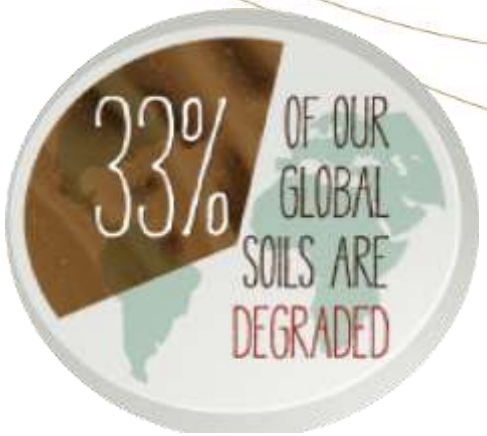
Promoting sustainable soil management for all

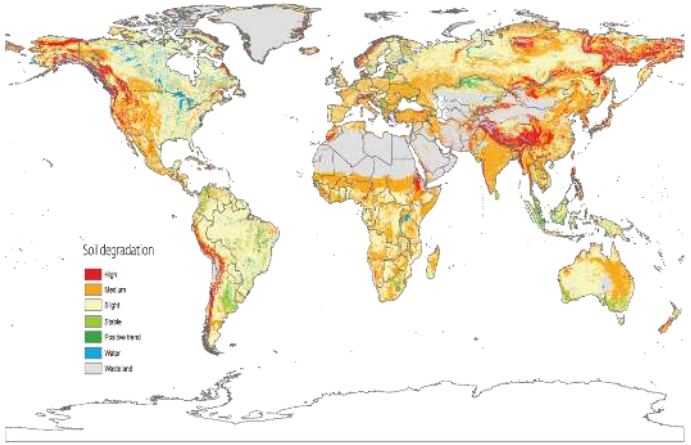
GLOBAL SOIL PARTNERSHIP

Global Challenges

Why soil organic carbon







Yet the world's soils are at risk and the situation will worsen if business as usual continues!

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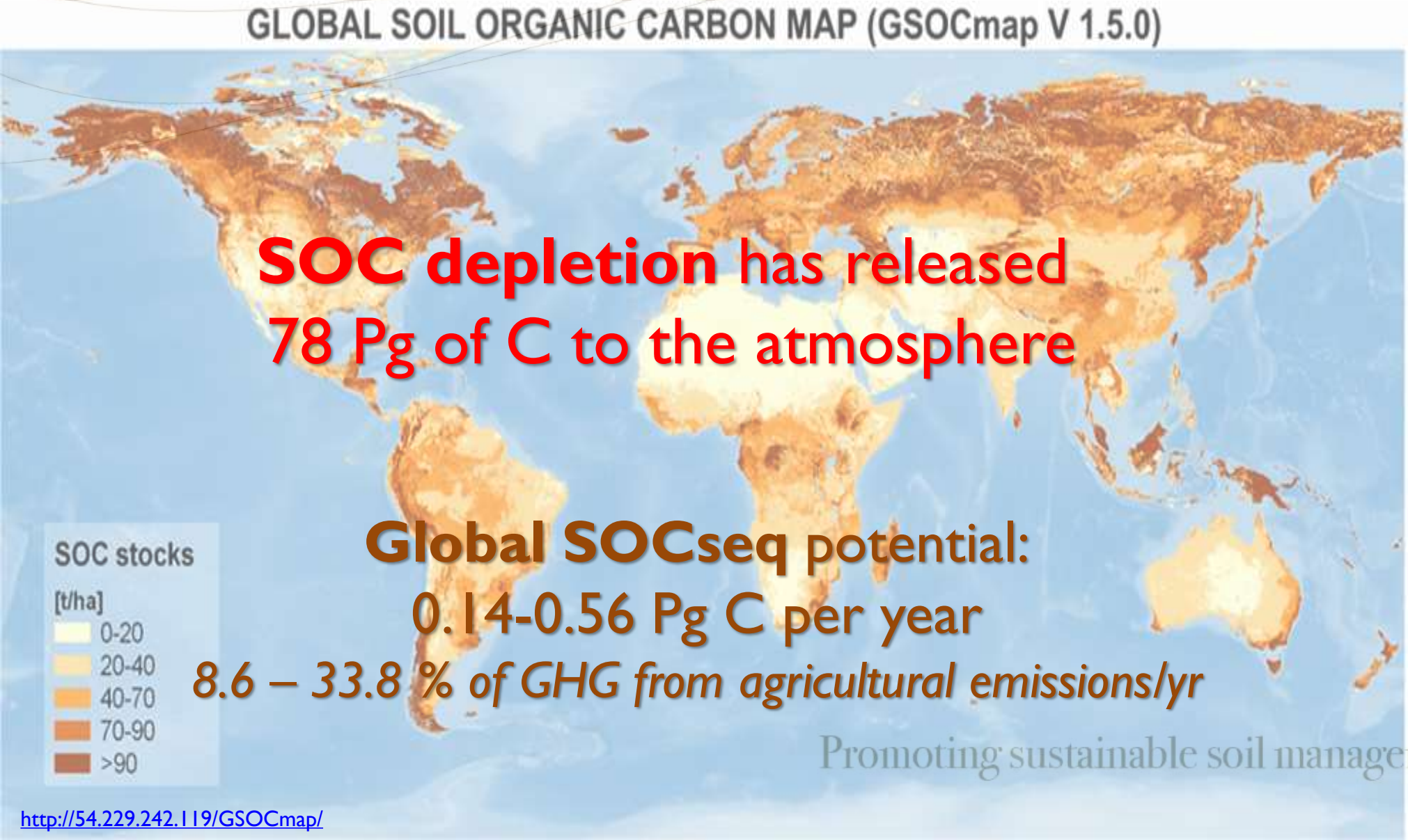
Why soil organic carbon?



SOC depletion has released
78 Pg of C to the atmosphere

Global SOCseq potential:
0.14-0.56 Pg C per year
8.6 – 33.8 % of GHG from agricultural emissions/yr

Global emissions of C are estimated at **135 Pg** due ***LUC*** and ***soil cultivation***

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http://54.229.242.119/GSOCmap/

RECSOIL framework

What is RECSOIL?

- An innovative initiative with the aim to boost **soil health** through the maintenance and enhancement of **SOC stocks.**
- It constitutes a mechanism whereby **farmers** are encouraged to **adopt sustainable practices** to improve soil health
- **Farmers** receive **technical support** and **financial incentives** (National and International Funds-Projects, Donors)

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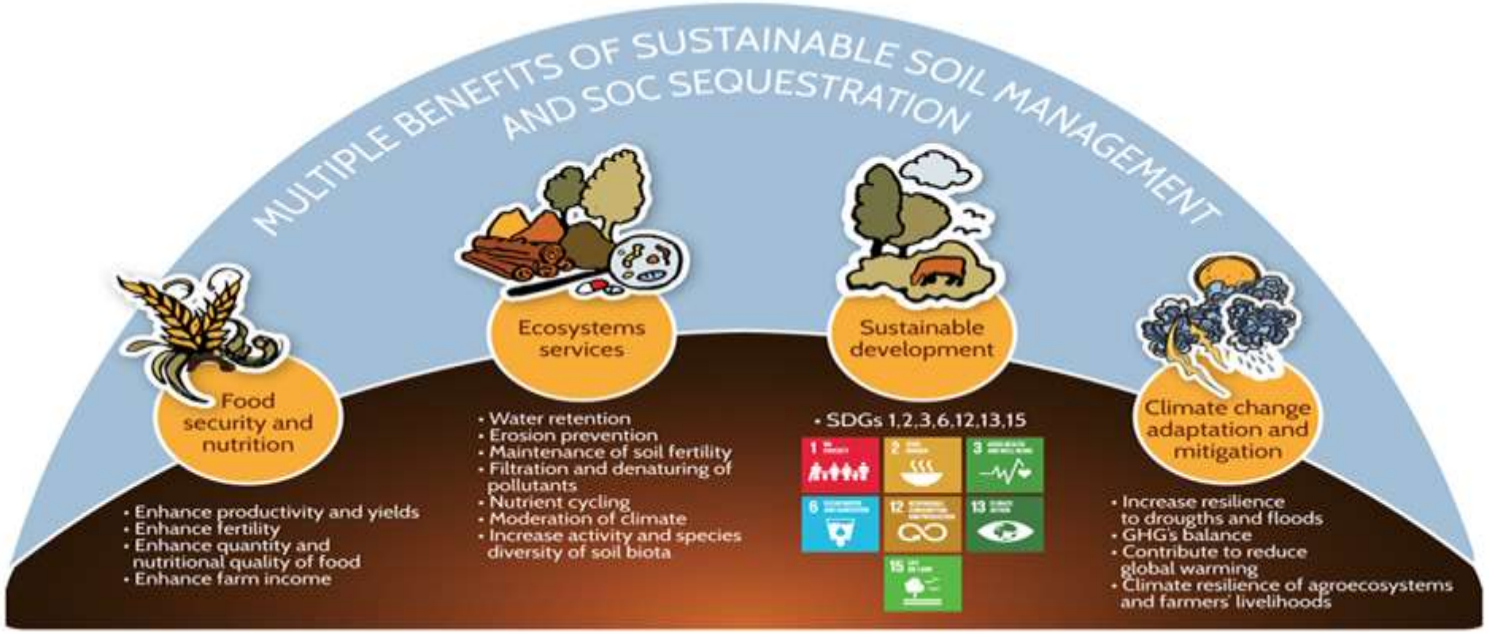
*RECSOIL is a mechanism for scaling up **sustainable soil management** implementation to **recarbonize** global **soils***



*The implementation of sustainable soil management practices focused on **SOC sequestration** can **restore key soil functions, boost soil health,** and support the provisioning of **ecosystem services**.*

FAO and ITPS, 2015

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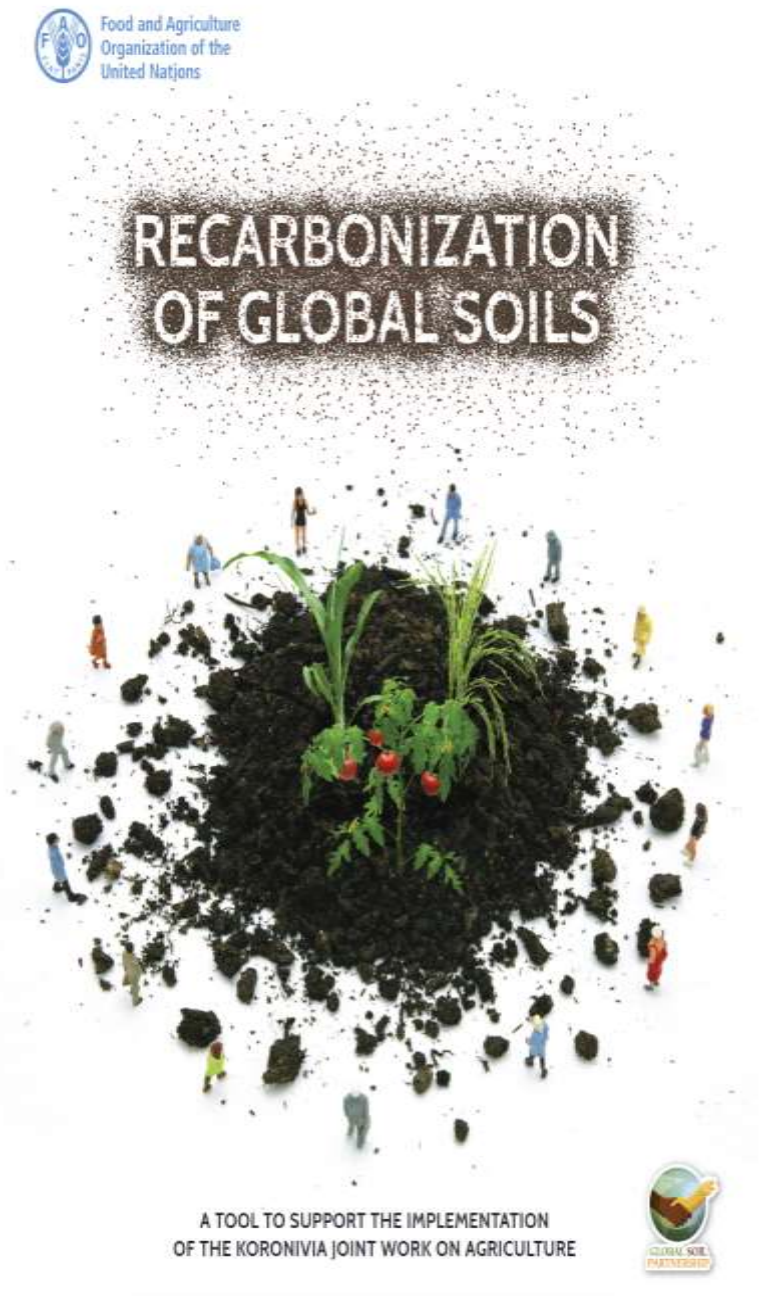

RECSOIL Goals

Stop further losses of SOC, maintain and increase SOC stocks

Boost soil health

Improve farmers livelihoods and recognize farmers' contributions to a better environment

Enhance food security (increase productivity) and food nutritional value

Build-up systems resilience and adaptation while supporting the provision of ecosystems services: support productivity, nutrient cycling, water quality & availability, and preserve biodiversity

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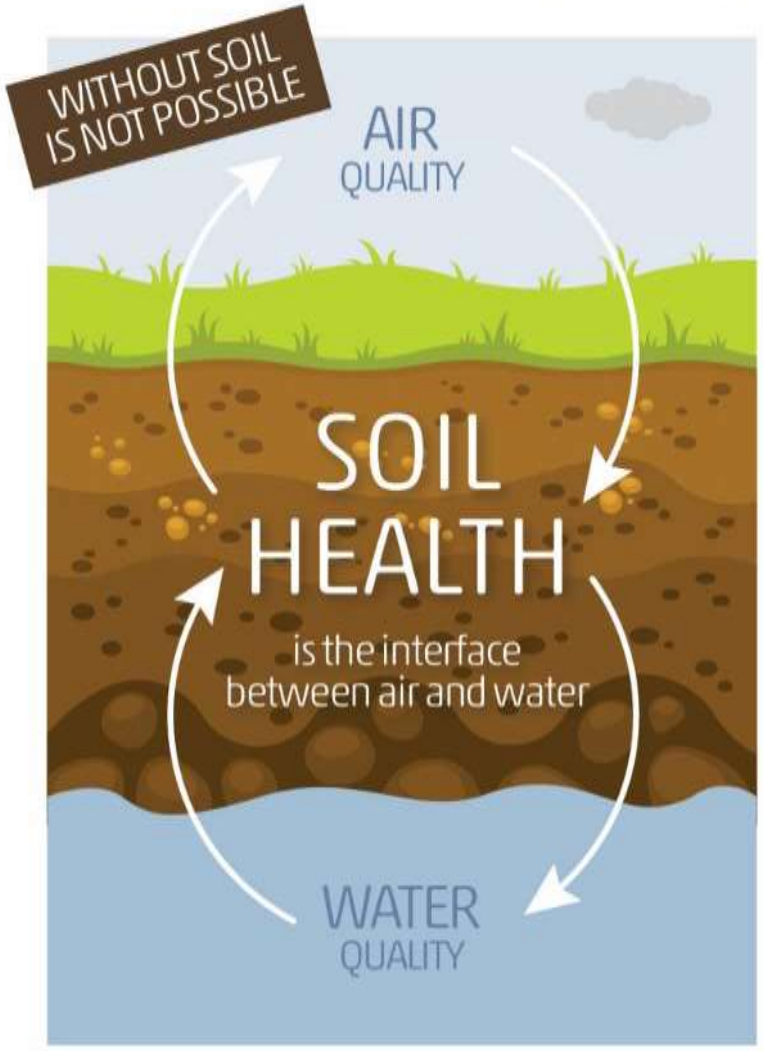
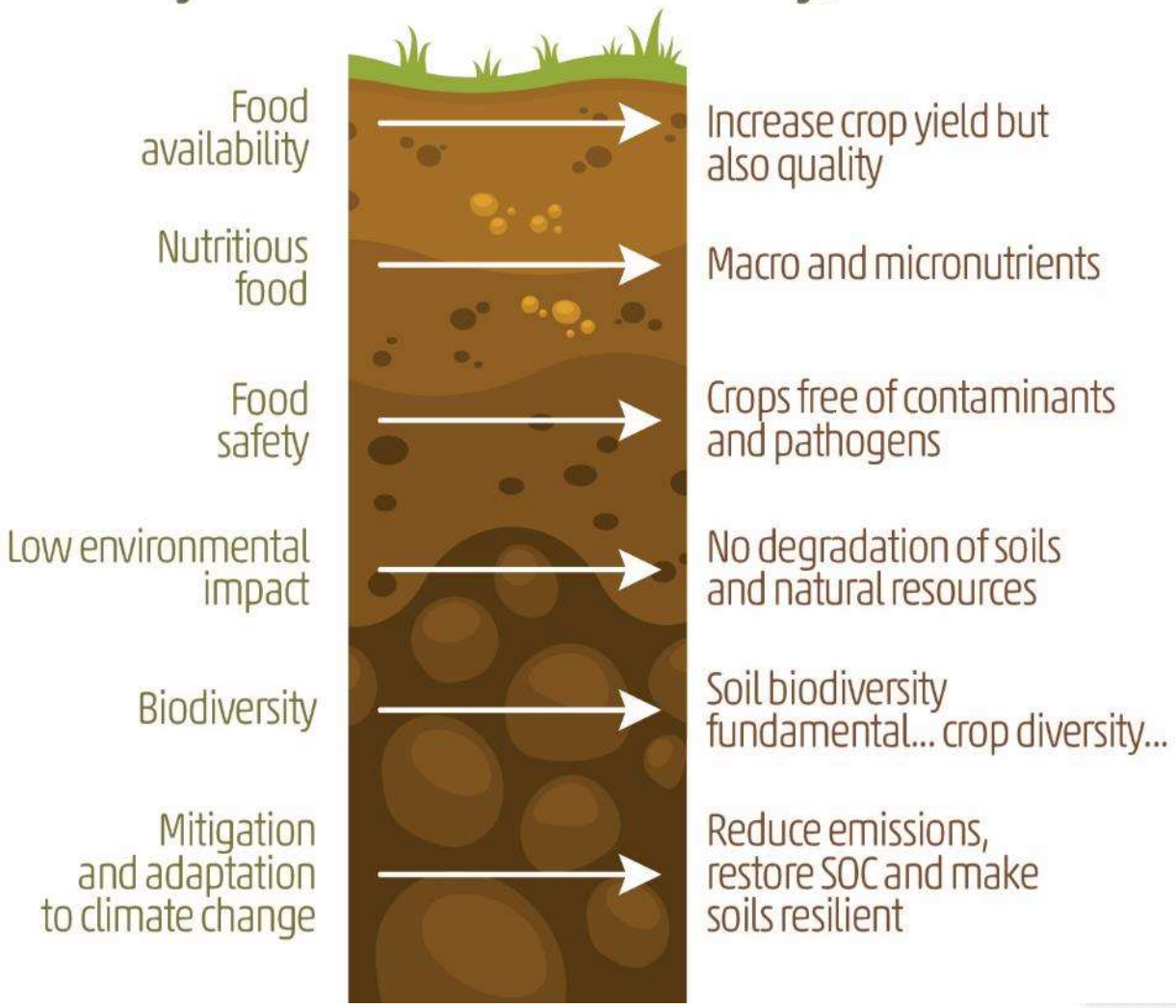
Sustainable Soil Management & Opportunities

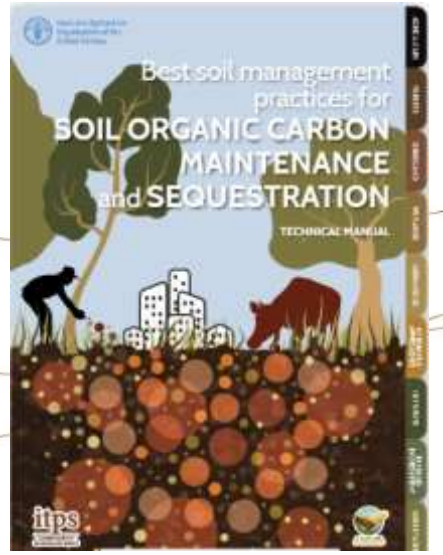
Environmental Quality



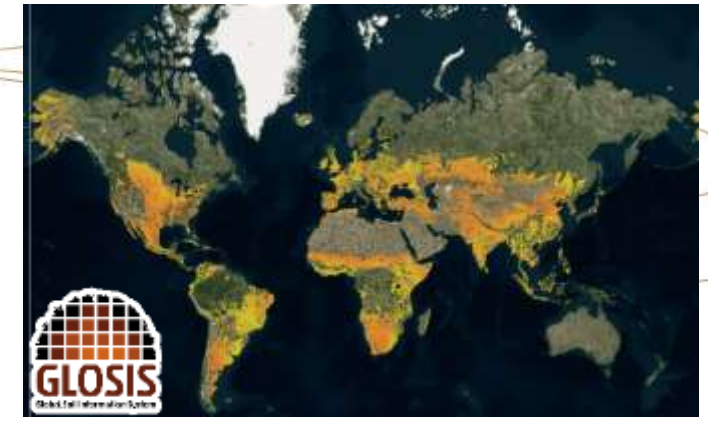
Healthy soils and Food Security/Nutrition



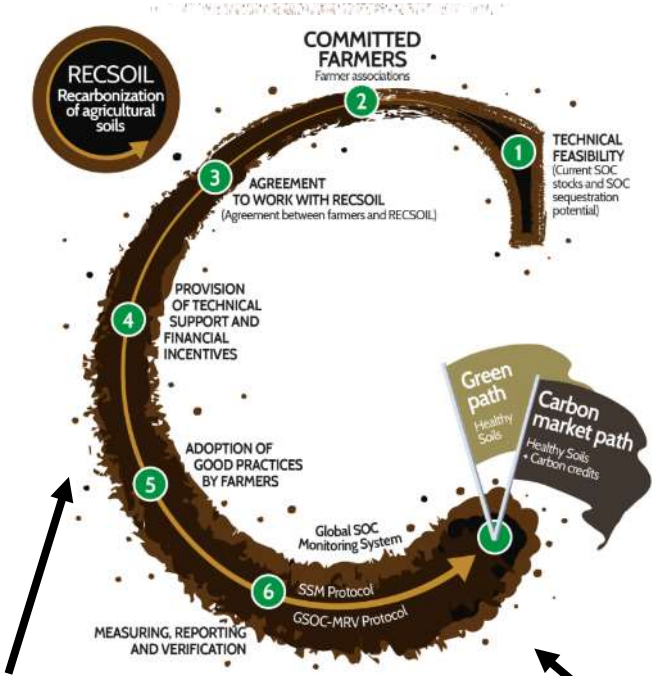
RECSOIL – Tools , Projects and Networks - FAO GSP



Technical Manual: Recommended Practices



GSOC and GSOCseq Maps and Capacity Development



SSM and GSOC MRV Protocols

BLACK SOILS
INTERNATIONAL NETWORK

International Network on Blacksoils – INBS
Special conservation areas

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK
Standard Operating Procedures (SOPs)

Harmonization of Laboratory Procedures e.g. for SOC

Soil Doctors
GLOBAL PROGRAMME
GLOBAL SOIL PARTNERSHIP

Technical Training and Capacity Building

RECSOIL

STAKEHOLDERS AND RESPONSIBILITIES

GSP SECRETARIAT

- Project Supervision
- Project co-creation
- Technical support
- Following up the scaling up of RECSOIL

FAO NATIONAL OFFICE

- Project Supervision II
- Project co-creation
- Identification of stakeholders
- Lateral agreements documentation

GOVERNMENTAL REPRESENTATIVE

- Project Manager
- Project co-creation
- Identification of stakeholders
- Sustainability
- Co-financing
- Project reporting supervision

NATIONAL TECHNICAL SUPPORT

- Project Coordinator
- Decision-making
- Financial administration
- Project co-creation
- Soil sampling campaigns
- Data curator (data collection & QC)
- Data analysis and Reporting
- Technical and extension services
- Coordination of capacity building and KE

SOIL LABORATORY/IES

- Project partner
- Soil lab analysis
- Lab quality assurance
- Lab results upload to the RECSOIL database
- Support data result interpretation

FARMER'S ASSOCIATION

- Project members
- Project co-creation
- Farmer's engagement
- Support to decision-making
- Material purchase
- Supervision of field operations

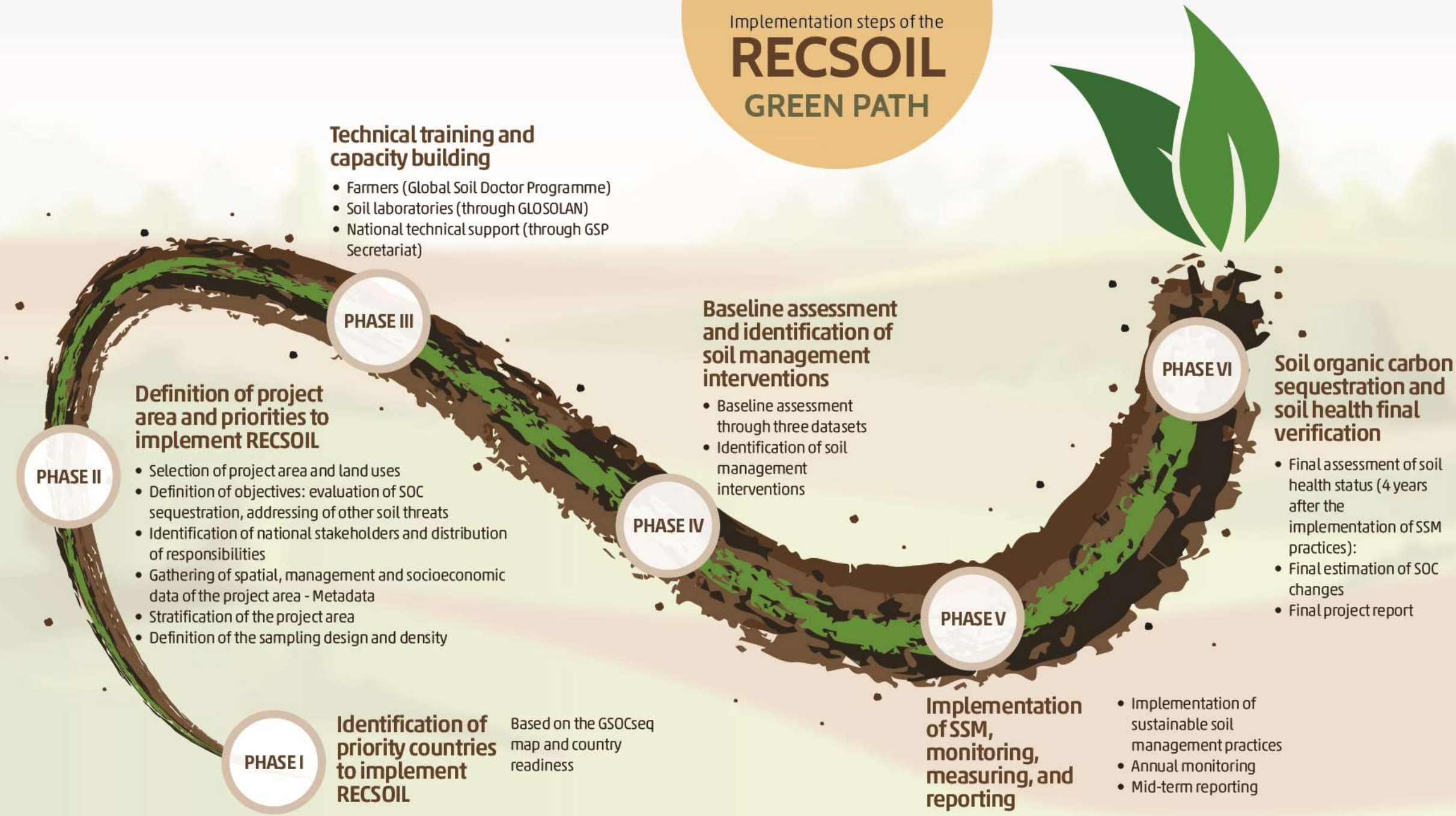
COMMUNITY LEADERS

'SOIL DOCTORS' & FARMERS

Implementation steps of the

RECSOIL

GREEN PATH



PHASE I

Identification of priority countries to implement RECSOIL

Based on the GSOCseq map and country readiness

PHASE II

Definition of project area and priorities to implement RECSOIL

- Selection of project area and land uses
- Definition of objectives: evaluation of SOC sequestration, addressing of other soil threats
- Identification of national stakeholders and distribution of responsibilities
- Gathering of spatial, management and socioeconomic data of the project area - Metadata
- Stratification of the project area
- Definition of the sampling design and density

PHASE III

Technical training and capacity building

- Farmers (Global Soil Doctor Programme)
- Soil laboratories (through GLOSOLAN)
- National technical support (through GSP Secretariat)

PHASE IV

Baseline assessment and identification of soil management interventions

- Baseline assessment through three datasets
- Identification of soil management interventions

PHASE V

Implementation of SSM, monitoring, measuring, and reporting

- Implementation of sustainable soil management practices
- Annual monitoring
- Mid-term reporting

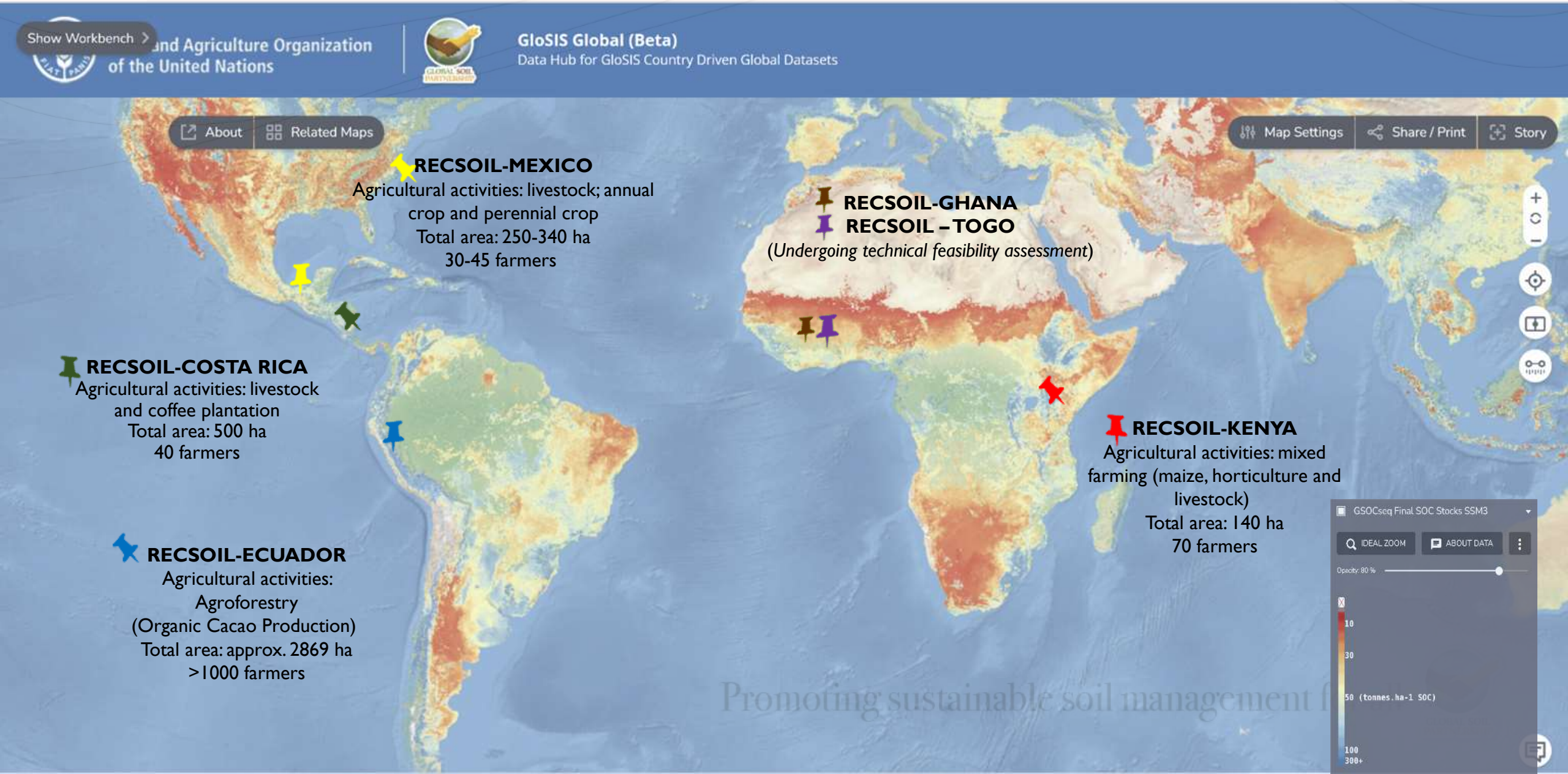
PHASE VI

Soil organic carbon sequestration and soil health final verification

- Final assessment of soil health status (4 years after the implementation of SSM practices):
- Final estimation of SOC changes
- Final project report

RECSOIL – Green Path

Piloting countries



Phase I – Identification of Priority Countries to Implement RECSOIL Pilot Projects [1 month]

GSOCseq: **identification** and **ranking** countries with the highest potential to SOCseq

Coupling GSOCseq map with Convergence of Global Change Issues Europe Nuts (JRC): biophysical and socioeconomic data

Assessment of country **readiness** to implement RECSOIL: assessment of national capacities on the provision of technical support and extension services to farmers

Assessment of **laboratory capacities** and **quality**

Identification of countries with **effective engagement** in previous collaborations with FAO and GSP activities

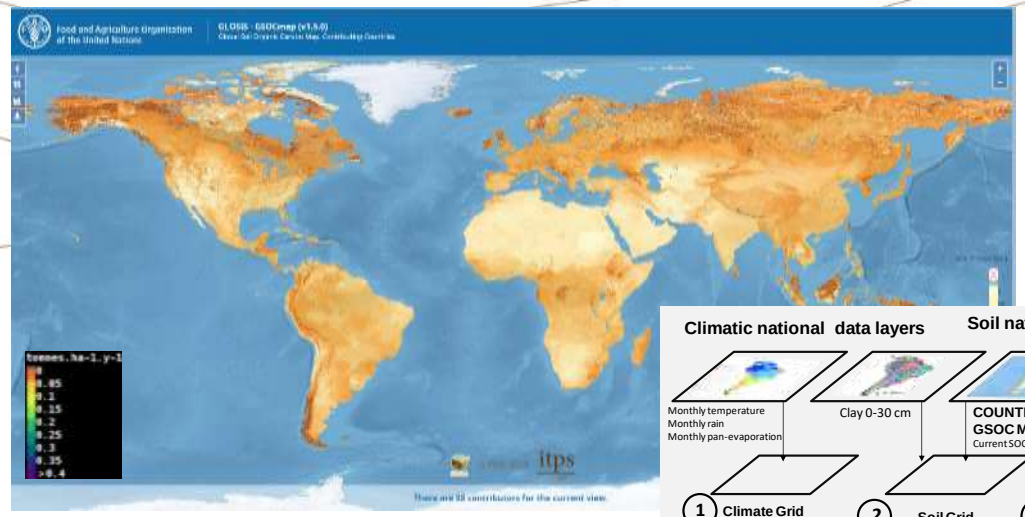
Phase I

RECSOIL 'toolkit': technical feasibility

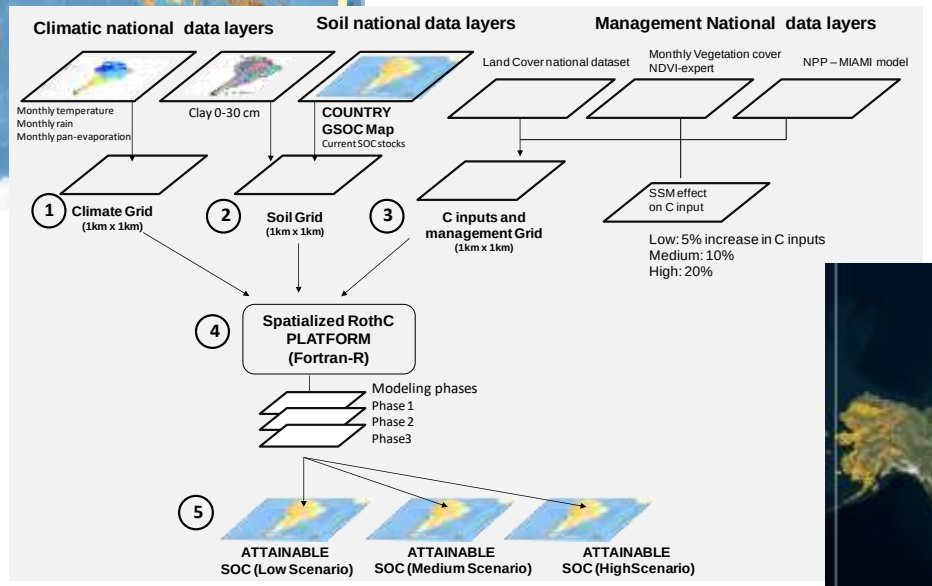
Where there is a high potential for SOCseq?

RECSOIL Recarbonization of agricultural soils

GSOCmap (V1.5.0)



Country-driven global data products



GSOCseq (V1.1.0)

→ *Identification of areas to maintain and increase SOC stocks*

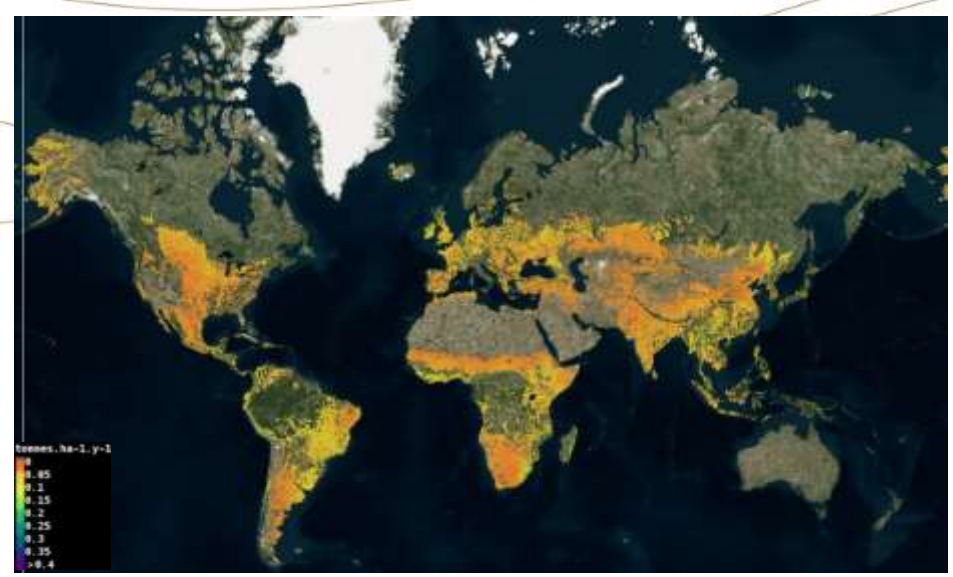
Promoting sus

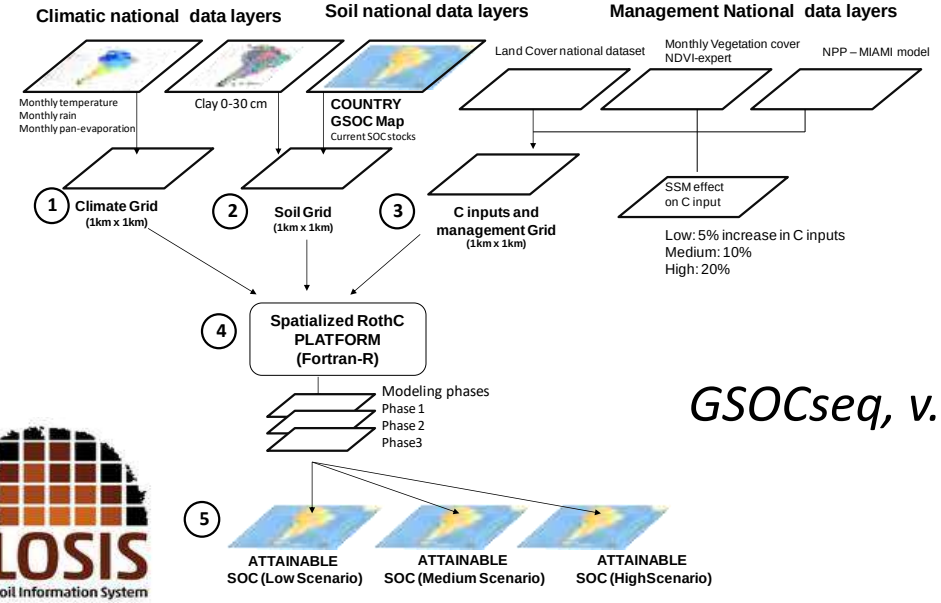
GLOSIS

Phase I

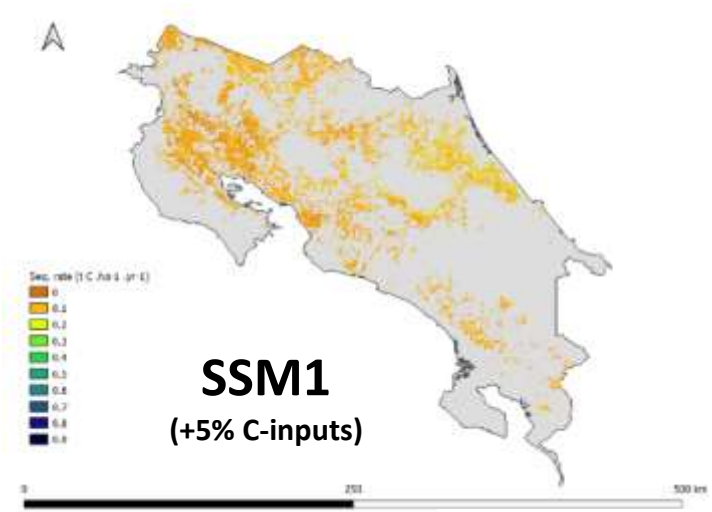
Where there is a high potential for SOCseq?

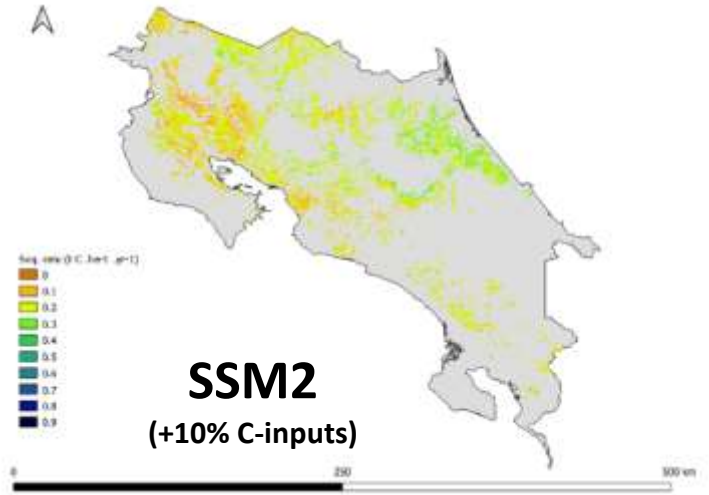
RECSOIL Recarbonization of agricultural soils

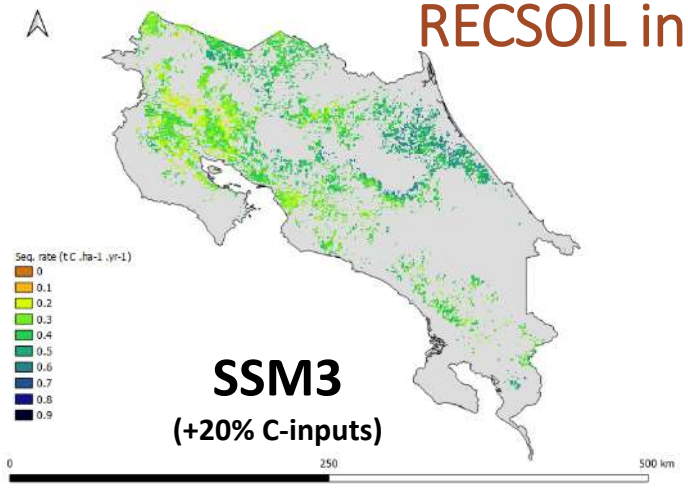




GSOCseq, v.1.1







RECSOIL in Costa Rica

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GLOSIS Global Soil Information System

GLOBAL SOIL PARTNERSHIP

First steps to implement RECSOIL

RECSOIL Country assessment of the SOCseq potential in the proposed project area

→

Refining the SOCseq country assessment updating soil database with existing local soil data

→

Review of the SOCseq potential results in collaboration with partners

↓

Identification of external collaborators/stakeholders

Farmers associations, farmers, and technical and extension services organizations

→

Development of Collaboration agreements

→

Deciding with the partners the strategy RECSOIL implementation plan based on local condictions

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Phase II – Establishment of collaborations and Project Co-creation [3 months]

- RECSOIL introduction to GSP-Focal Point: Agreement on the **selection of project area** and **adaptation of RECSOIL** framework to local conditions
- Identification of **stakeholders**: research associations, national government etc
- Project Co-creation, development of **working plan** and **budgeting**
- Establishment of **collaboration agreements** with stakeholders through LoAs, Grant agreements and Terms of Reference (Facilitator > FAO national office, Promoter and Trainers >Technical support and extension services; Farmers > SSM implementers; Soil laboratory > soil analysis)
- Commencement of **capacity building**: Soil Doctors programme, MRVs training, GLOSOLAN training sessions and 'Welcome call' to introduce RECSOIL pilot project and laboratory deliverables
- Registration of project data: RECSOIL **database**

Togo Soil Organic Map: SOC stocks, RECSOIL tool: GSOCmap V1.6

Country* SOC stocks average in comparison to the SOC stocks in the *project location

Togo SOC stock levels
Mean = 35 tC/ha
Min = 12 tC/ha
Max = 87 tC/ha

Togo SOC stock levels at the pre-selected area
Mean = 36 tC/ha
Min = 34 tC/ha
Max = 41 tC/ha

Data technical note
Country database not available
Gap-filling approach

The SOC in the pre-selected project location is approximately equal to the country's mean level and slightly below the global mean SOC stock levels

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GLOBAL SOIL PARTNERSHIP

Togo Soil Organic Carbon sequestration potential (RECSOIL tool: GSOCseq V1.1)

SOCseq potential in 3 scenarios

SSM1 →

SSM2 →

SSM3 →

Annual
SOC sequestration rates

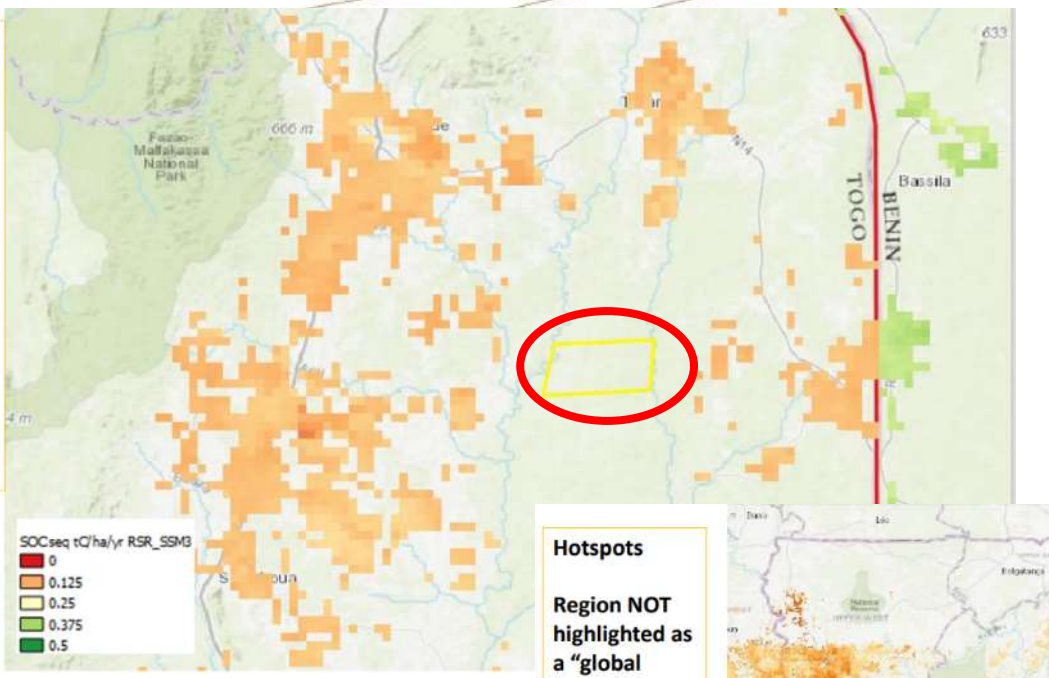
No information on exact Project Location

Area with Medium to Low sequestration levels

Rates= 0.02-0.04 tC/ha /yr for Low Scenario

Rates= 0.05-0.09 tC/ha /yr for Medium Scenario

Rates= 0,09-0,12 tC/ha /yr For High Scenario



Data technical note

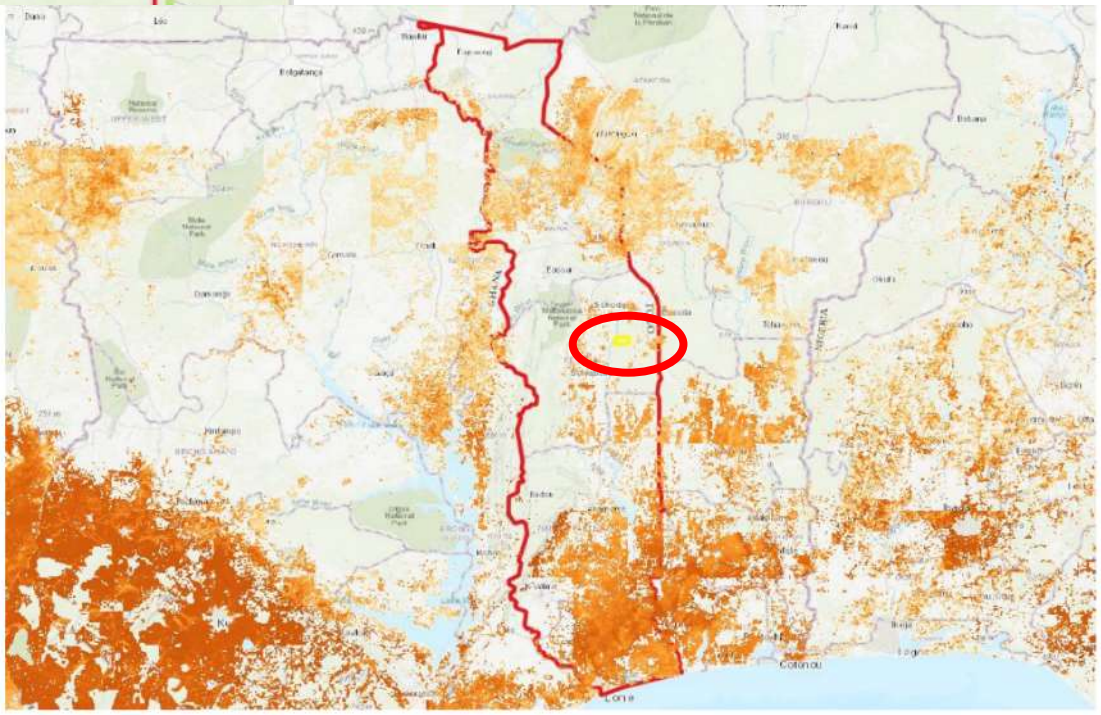
Country database not available
Gap-filling approach

Hotspots

Region NOT highlighted as a "global hotspot"

(high SOC sequestration + high convergence of issues)

Dark= higher SOC sequestration



Convergence Global Change Issues (JRC), data layers

Biophysical

Aridity index
Water stress
Land productivity
Climate-vegetation trends (droughts risk!)
Fires (number of fires)
Tree loss

Socioeconomic

Income level
Built-up area
Low-input or high input agriculture
Irrigation
Livestock density

Source: WAD | World Atlas of Desertification (europa.eu)

Kenya Soil Organic Carbon sequestration potential (RECSOIL tool: GSOCseq V1.1)

RECSOIL Recarbonization of agricultural soils

SOCseq potential in 3 scenarios

Annual SOC sequestration rates

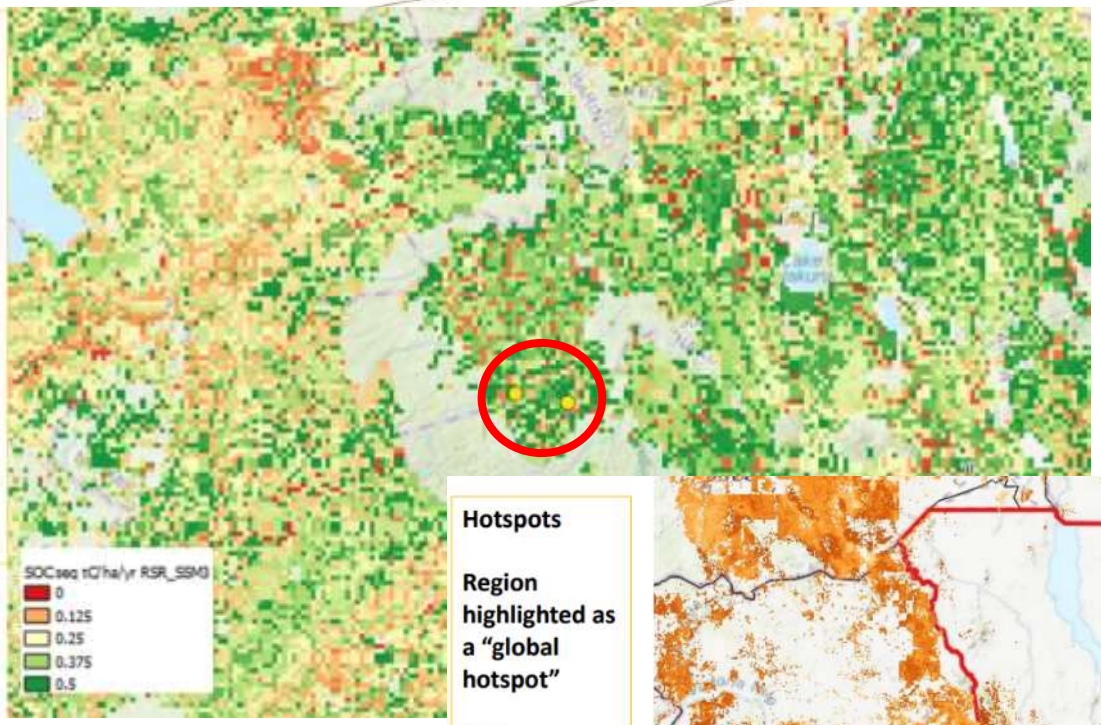
Area with High sequestration levels (Compared To Global and Country average)

SSM1 → Rates= 0.04-0.18 tC/ha /yr for Low Scenario

SSM2 → Rates= 0.08-0.36 tC/ha /yr for Medium Scenario

SSM3 → Rates= 0.20-0.50 tC/ha /yr For High Scenario

(Country Average High = 0.17tC/ha /yr)



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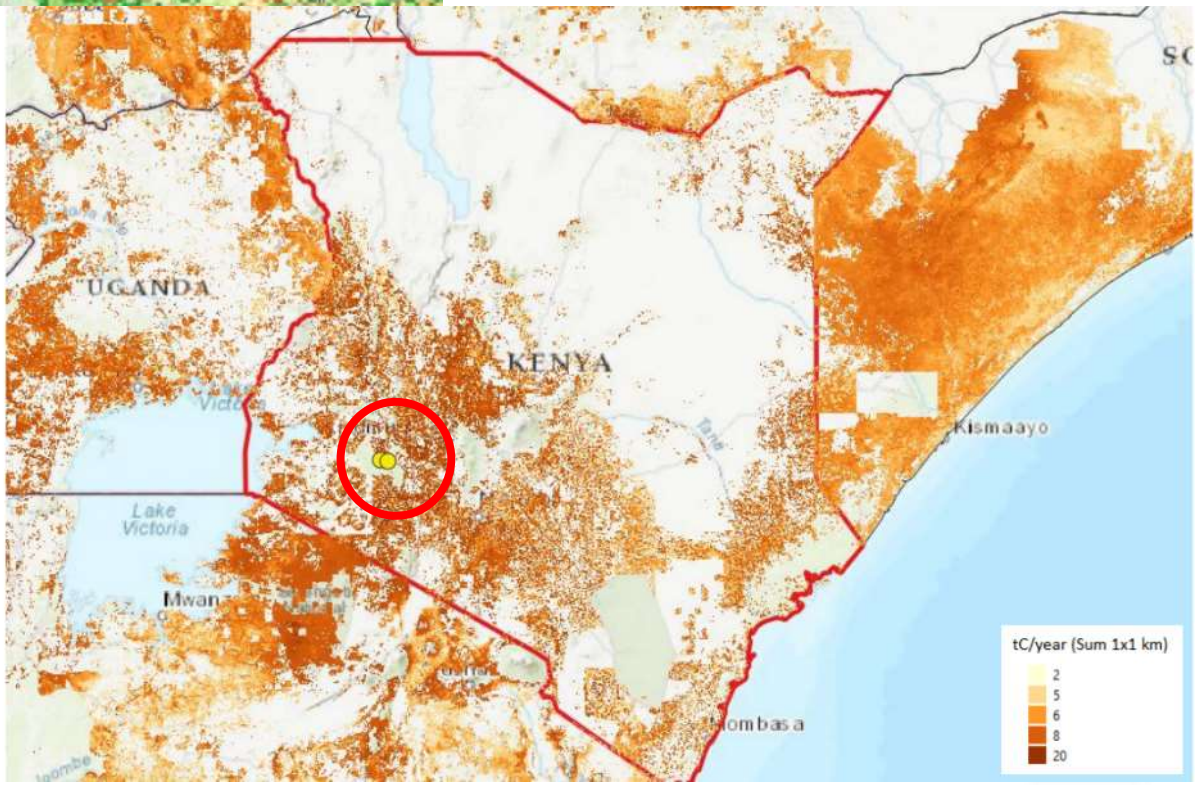

Data technical note

Country database not available

Gap-filling approach

Convergence Global Change Issues (JRC), data layers

Biophysical

Aridity index

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Source: WAD | World Atlas of Desertification (europa.eu)

GLOSIS Global Soil Information System

Kenya Soil Organic Map: SOC stocks, RECSOIL tool: GSOCmap V1.6

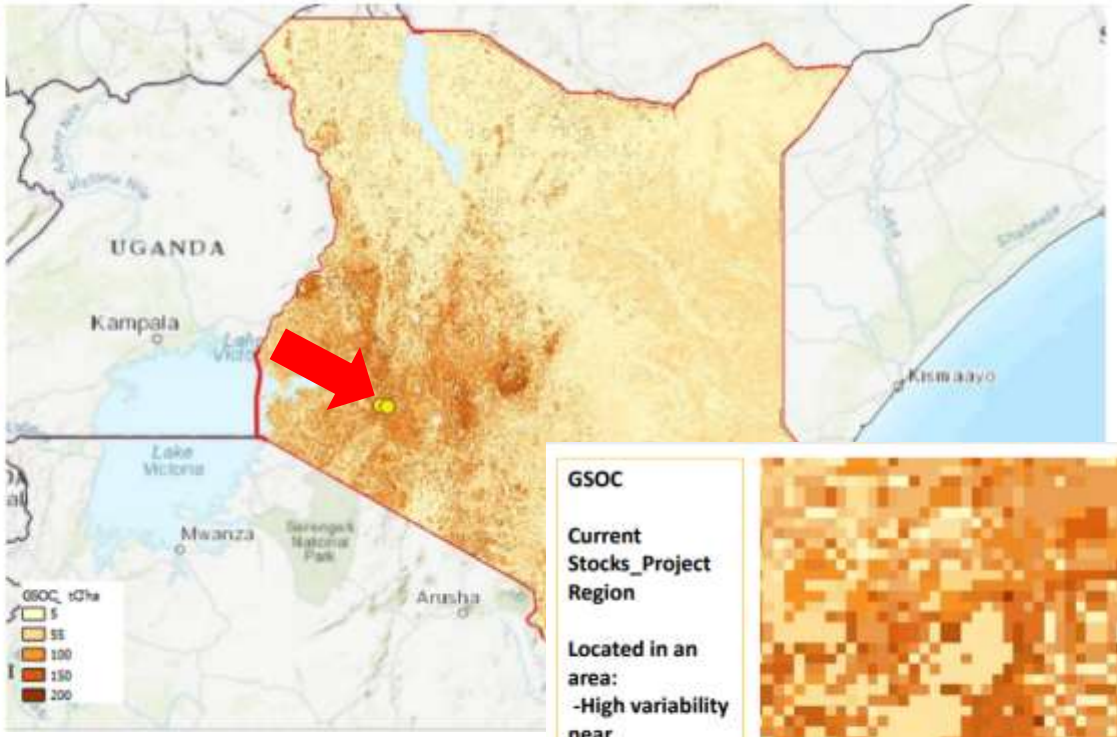
GSOC

Current Stocks_Country

Mean = 40 tC/ha

Min=1.2 tC/ha

Max=212 tC/ha



<u>Country</u> SOC stocks average in comparison to SOC stocks in the <u>project location</u>

GSOC

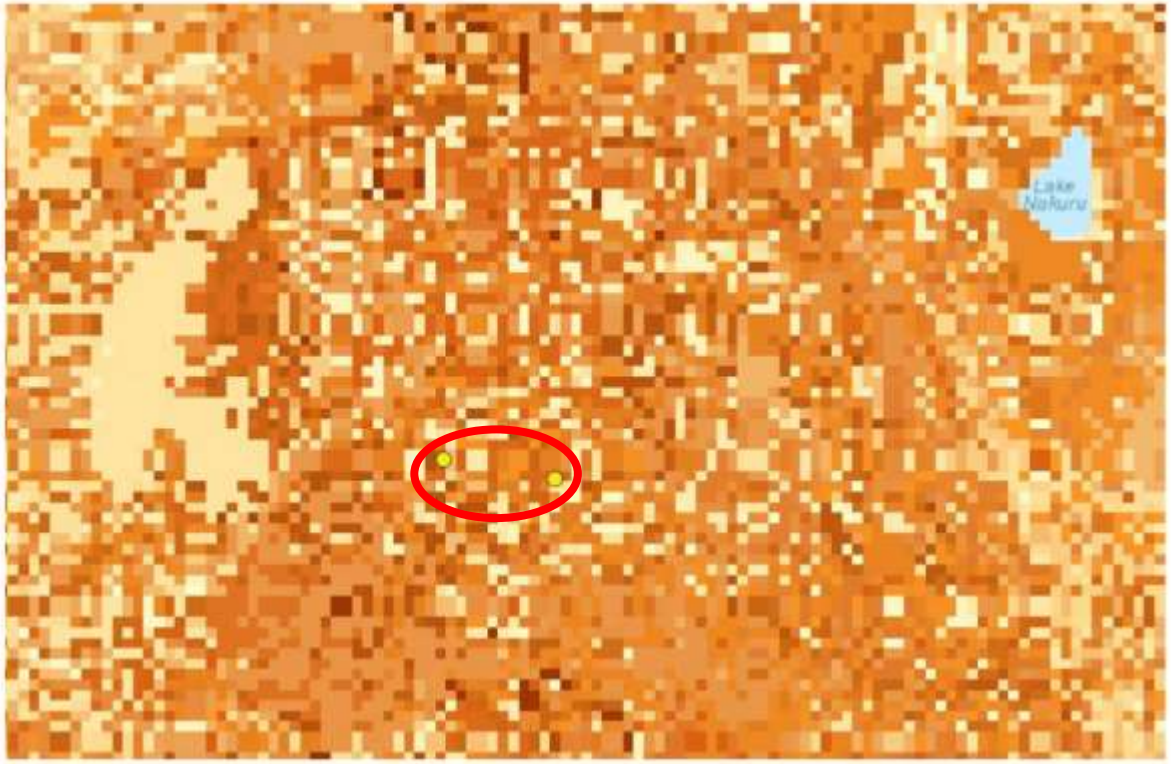
Current Stocks_Project Region

Located in an area:
-High variability near
-SOC stocks avove National average

Mean = 95 tC/ha

Min=14tC/ha

Max=149 tC/ha



Data technical note

Country database not available

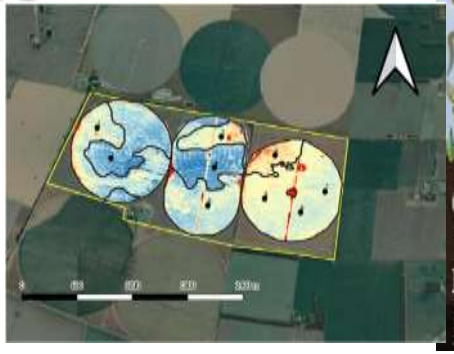
Gap-filling approach

Phase III – Commencement of capacity building activities [6months]

- Module 1: strengthening National Technical Services: SOC-MRV and SSM protocols
- Module 2: capacity development for Soil Laboratories: GLOSOLAN training sessions
- Module 3: raising soil awareness and promoting knowledge exchange among Farmers: Soil Doctors Programme

RECSOIL toolkit: Capacity development

strengthening technical and extension services



Module I: MRV-SSM protocols

Capacity development

National technical experts

- ✧ Soil mapping (if required)
- ✧ GSOC-MRV Protocol: project area stratification and soil sampling design; SOC stocks and GHG emissions
- ✧ SSM Protocol: visual soil assessment and soil indicators for evaluation of soil health status
- ✧ RECSOIL database

Indicator	Parameter/ metric
Soil productivity	Agricultural productivity or biomass in dry matter ($t\ ha^{-1}\ year^{-1}$)
Soil organic carbon	Organic carbon (%)

Indicator	Parameter/ metric
Soil physical properties	Bulk density ($kg\ dm^{-3}$) In some cases, bulk density can be complemented by available water capacity, or other relevant soil physical properties *(See additional indicators)*
Soil biological activity	Soil respiration rate ($gCO_2\ m^{-2}\ d^{-1}$) Ideally combined with at least one other biological indicator *(See soil biological activity p. 4 and 5)*

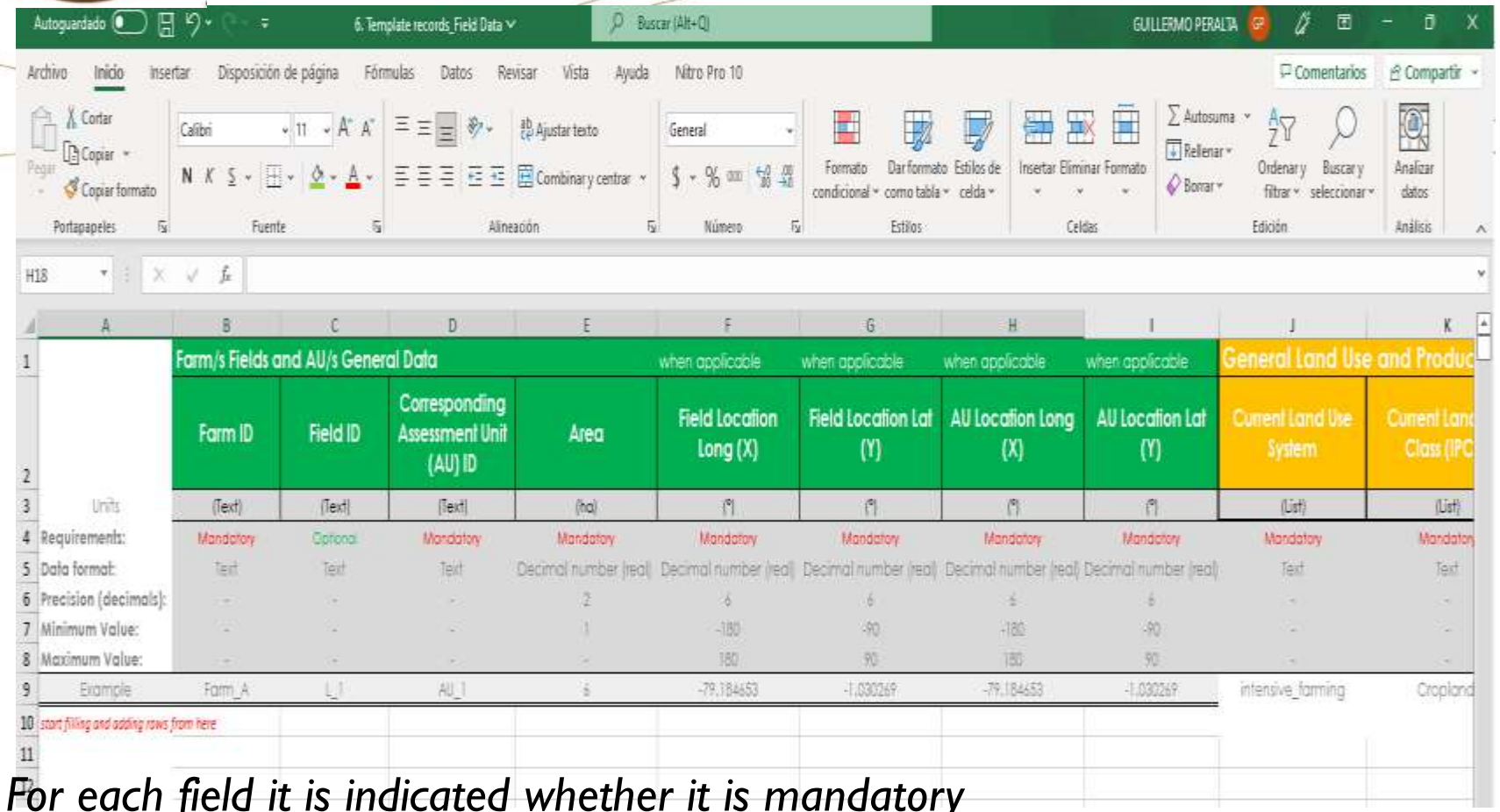
Data harmonization and processing

Most data processed in one **spreadsheet** or multiple spreadsheets (eg Microsoft Excel, OpenOffice, LibreOffice, Google Sheets, others) and are linked with a code.

In case of multiple projects, more complex database may be required (Microsoft Access, Oracle, MySQL, etc.)

RECSOIL
Recarbonization of agricultural soils

An Excel spreadsheet template ("Template Records") is provided as a guide for collecting and processing the required information



	A	B	C	D	E	F	G	H	I	J	K
1		Farm/s Fields and AU/s General Data				when applicable	when applicable	when applicable	when applicable	General Land Use and Produc	
2		Farm ID	Field ID	Corresponding Assessment Unit (AU) ID	Area	Field Location Long (X)	Field Location Lat (Y)	AU Location Long (X)	AU Location Lat (Y)	Current Land Use System	Current Land Class (IPC
3	Units	(Text)	(Text)	(Text)	(ha)	(°)	(°)	(°)	(°)	(List)	(List)
4	Requirements:	Mandatory	Optional	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
5	Data format:	Text	Text	Text	Decimal number (real)	Decimal number (real)	Decimal number (real)	Decimal number (real)	Decimal number (real)	Text	Text
6	Precision (decimals):	-	-	-	2	6	6	6	6	-	-
7	Minimum Value:	-	-	-	1	-180	-90	-180	-90	-	-
8	Maximum Value:	-	-	-	-	180	90	180	90	-	-
9	Example	Farm_A	L_1	AU_1	5	-79.184653	-1.030269	-79.184653	-1.030269	intensive_farming	Cropland
10	start filling and adding rows from here										
11											

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RECSOIL DATA COLLECTION FORM

moritzfmainka@gmail.com has invited you to use their app

Visit this page on your mobile device to install:

https://appsheet.com/newshortcut

Preview App in Browser

For each field it is indicated whether it is mandatory or optional, the type of data (number, text), precision, maximum and minimum values, etc…

Promoting sustainable soil management for all

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RECSOIL toolkit: Capacity development strengthening technical and extension services

Module II: Soil analysis

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

Capacity development

Soil laboratory staff

- Quality Assurance/Quality Control
- Standard Operating Procedures
- Promoting of new technologies
- RECSOIL database

If you cannot measure it, you cannot manage it…

high-quality soil data, for sustainable soil management!

RECSOIL toolkit: Capacity development
strengthening technical and extension services

Module III:
Global Soil Doctors Programme

Capacity development

Trainers and farmers

- General soil properties and fertility
- Sustainable soil management
- Soil testing kit for assessment of soil parameters *in situ*
- Visual soil assessment: soil health status
- RECSOIL Programme

Posters

Soil kits

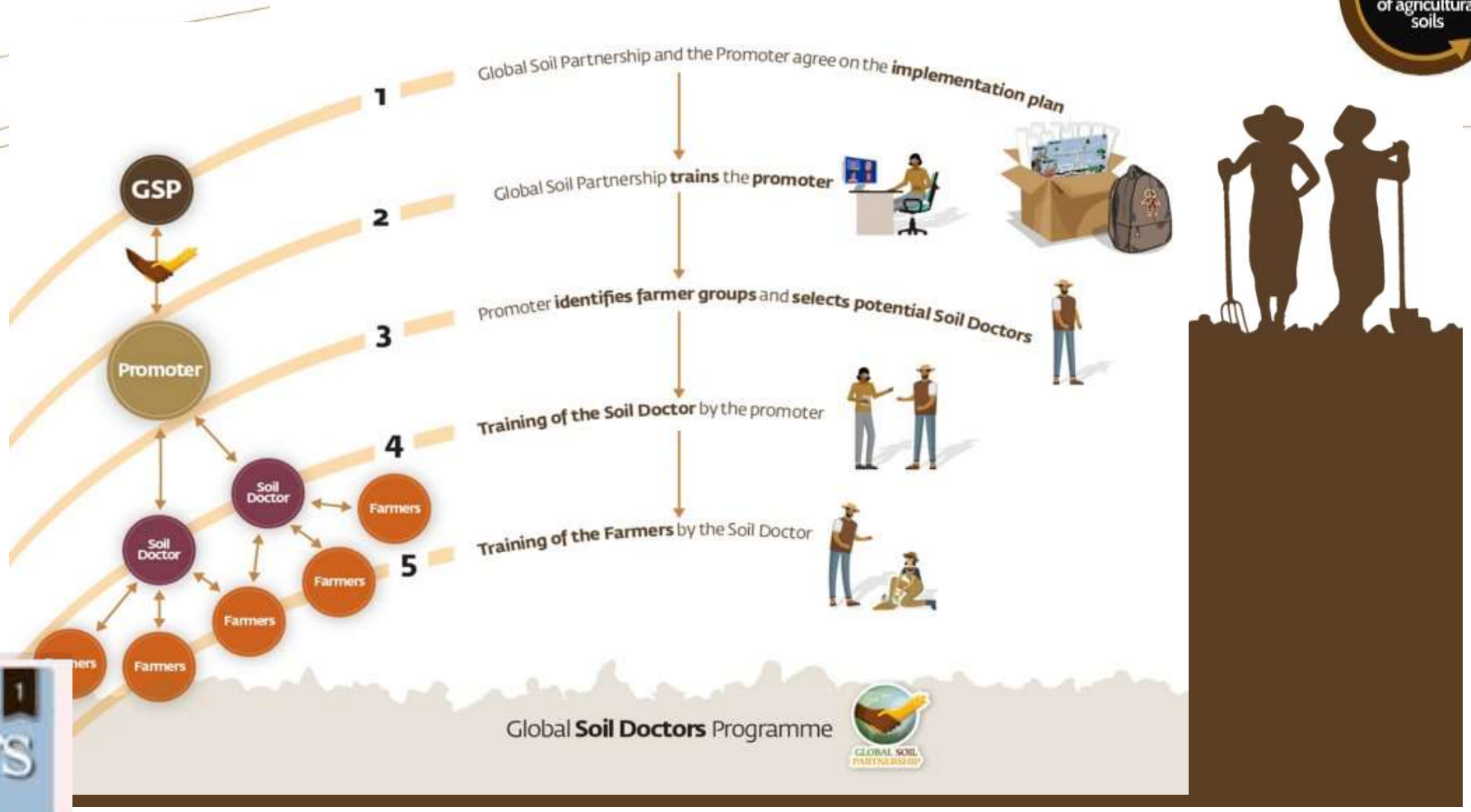
Visual Soil Assessment

RECSOIL 'toolkit': capacity building

Soil Doctors
GLOBAL PROGRAMME
GLOBAL SOIL PARTNERSHIP

RECSOIL
Recarbonization of agricultural soils

Strengthen the extension services and farmers knowledge on SSM



Promoters' registration form

The first step for the implementation of the Global Soil Doctors Programme (GSDP) at the local level is the identification of a potential Promoter. To determine your institution suitability in implementing the Global Soil Doctors programme, please read the terms of reference (included below). If you are interested in supporting the implementation of the programme in your country, please fill-in the present form. You will receive a CONFIRM of the registration by e-mail.

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Phase IV – Baseline measurement and identification of soil management practices [6 months]

- ✧ Baseline Assessment and data collection: GSOC-MRV Protocol and Protocol for Assessment of SSM, including soil visual assessment
- ✧ Assessment of soil health status and estimation of SOC stocks and GHG emissions.
- ✧ Identification of soil management practices and selection of good practices for SSM

Phase V – Implementation of SSM practices and monitoring, measuring and reporting [48 months]

- Assessment of soil health status: annually, visual soil assessment (VSA)
- Annual monitoring: visual soil assessment and reports
- Continuous upload of field data to the RECSOIL **Database**
- Annual payment of financial incentive to farmers: year 1, year 2 and year 3

GSOCseq tool in Ecuador

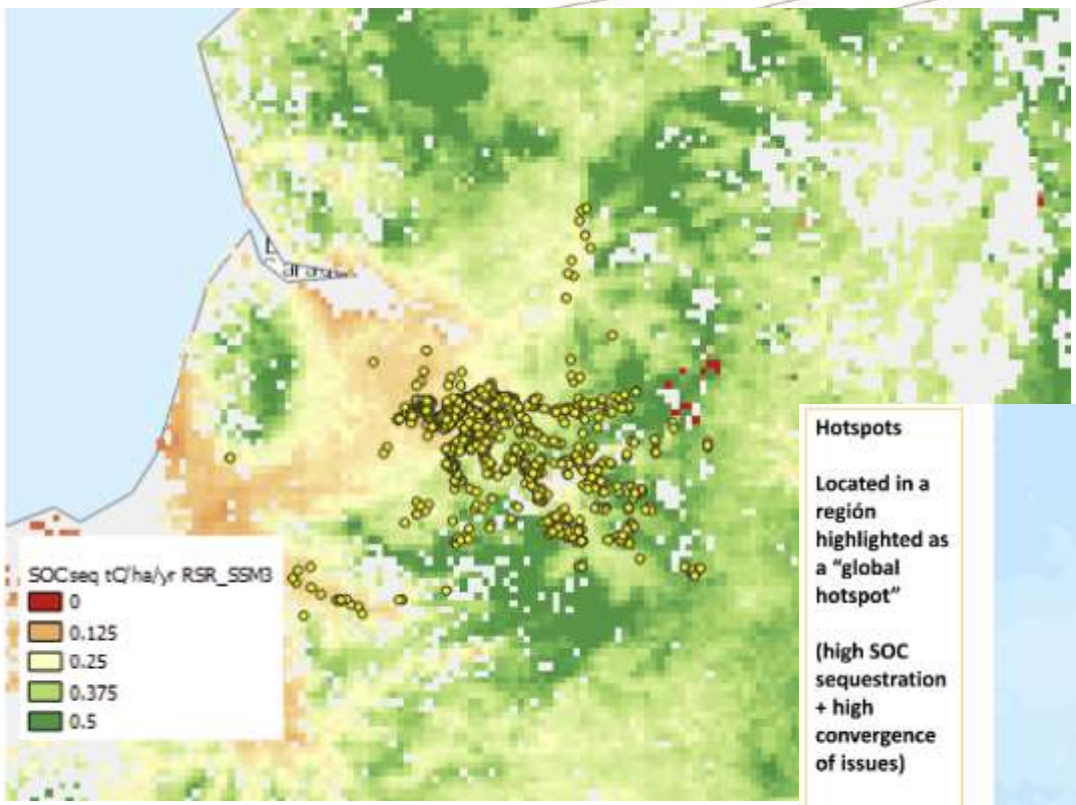
Annual
SOC sequestration rates

Higher rates to the East
Lower rates to the west

SSM 1 (+5%) Rates= 0,04-0,12 tC/ha /yr for Low Scenario

SSM 2 (+10%) Rates= 0,09-0,3 tC/ha /yr for Medium Scenario

SSM 3 (+20%) Rates= 0,19-0,51 tC/ha /yr For High Scenario



Hotspots

Located in a región highlighted as a "global hotspot"

(high SOC sequestration + high convergence of issues)

Dark= higher SOC sequestration

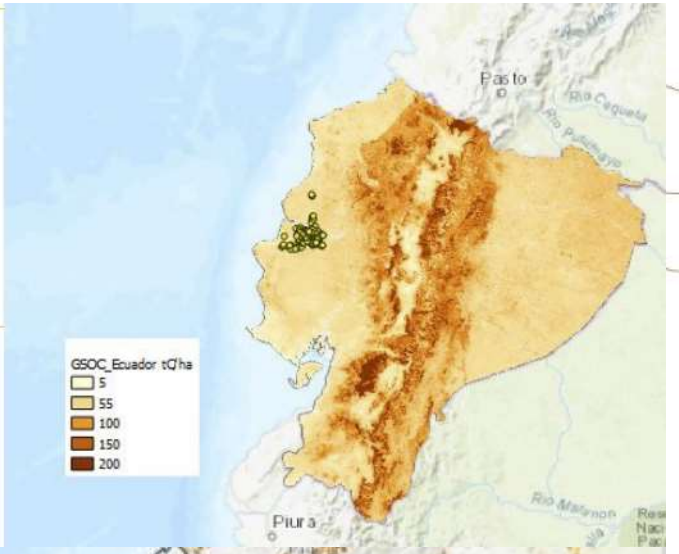
GSOC

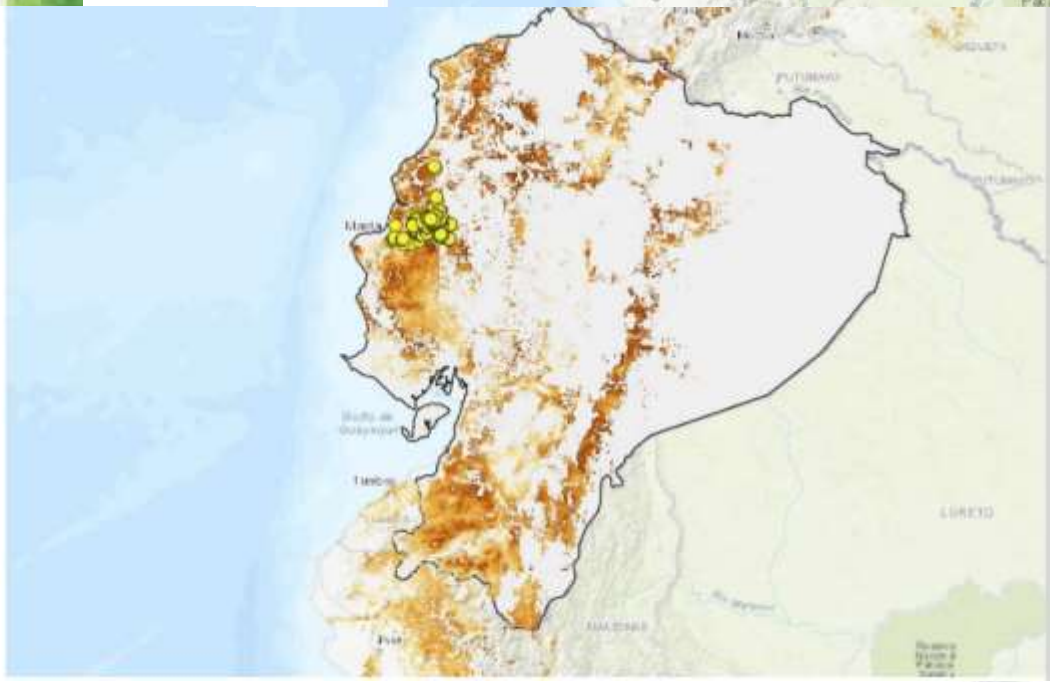
Current Stocks_Ecuador

Mean Ecuador= 74 tC/ha

Min=6,8 tC/ha

Max=302 tC/ha





Data technical note Ecuador databse (2009-2016)
Number of samples: 12861
Data from Ministry of Agriculture and Granaderia of Ecuador (CGINA-DGGA)
Scale: 1 km x 1 km
Scenario: 20 years

GLOSIS
Global Soil Information System

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1. SSM Protocol - Green Path -

4 Key indicators

Soil productivity 	Agricultural productivity or biomass in dry matter (t ha^{-1} $year^{-1}$)
Soil organic carbon 	Organic carbon (%)
Soil physical properties 	Bulk density (kg dm^{-3}) In some cases, bulk density can be complemented by available water capacity, or other relevant soil physical properties *(See additional indicators)*
Soil biological activity 	Soil respiration rate (gCO_2 m^{-2} d^{-1}) Ideally combined with at least one other biological indicator *(See soil biological activity p. 4 and 5)*

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Green Path - SSM Protocol – Additional Indicators – depend on the main threats to soil health

Soil Nutrients
(P, N, K, etc)

Soil salinity
(EC- Electrical conductivity)

Acidity – Alkalinity
pH

Available water capacity
(FC-PWP)

Water infiltration

Soil penetration resistance

Erosion
(USLE, erosión pins, Gerlacht boxes, etc)

Biological activity
(Enzimatic activity, microbial biomass, etc.)

Diversidad
(e.g. pitfall traps, etc)

Soil pollution
(concentration, trace elements, pesticides, etc)

Phase VI – Soil Organic Carbon Sequestration and Soil Health Final Verification

- Final assessment of soil health, SOC stocks change and GHG emissions: 4 years after implementation.
- Submission of the final report for verification of compliance
- Final verification of compliance with the Protocol for Assessment of SSM for Green Path or GSOC-MRV Protocol from Carbon Market Path
- Final Report at 4th year for Green Path and following up RECSOIL scaling –up in the country

RECSOIL toolkit: Implementation of SSM, monitoring, measuring and reporting

RECSOIL – Green Path

Other 'soil threats'

- ✧ Black soils
- ✧ Salt-affected soils
- ✧ Global assessment of soil pollution
- ✧ State of knowledge of soil biodiversity
- ✧ Code of conduct on sustainable fertilizer use and management

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Challenges

Potential main barriers to implementation of SSM

- Biophysical
- Cultural
- Social
- Economic
- Institutional
- Legal
- Knowledge

Benefits for Farmers

Improvement of **technical knowledge on sustainable soil management**, and provision of **technical support** to implement **SSM** and improve soil health, enhance yield productivity and system resilience

The implementation of **sustainable soil management** practices will **decrease the need** for external inputs, such as minerals fertilizers, pesticides, and use of machinery etc. As a result, there will be a decrease in the overall cost of production.

The implementation of RECSOIL programme will help farmers to be acknowledged for their **substantial contribution** to the environment by supporting **the provision of ecosystems services**

Food and Agriculture Organization of the United Nations

Thank you...

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