SOIL ORGANIC CARBON ACTIVITY MODULE

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RELATED DOCUMENTS
– Soil Organic Carbon Framework Methodology v.1.0
– SOC Activity Modules Approval Procedure v.1.0

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- The developer shall delete the guidance blue box after completion of the draft.
- The developer shall complete all sections. Where not applicable, the developer shall insert “NA”. Please do not delete any of the sections/subsections of the template.
SOC ACTIVITY MODULE FOR BIOSTIMULANTS FOR SOIL REVITALIZATION

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1 | Summary

This Soil Organic Carbon (SOC) Activity Module presents requirements and guidance to quantify and monitor greenhouse gas (GHG) emissions and soil organic carbon (SOC) changes resulting from change in soil management practices within agricultural systems through application of biostimulants for soil revitalisation. The eligible activities are intended to achieve net carbon sequestration in the soil carbon pool. This activity module shall be applied in conjunction with the Soil Organic Carbon Framework Methodology.

This Activity Module incentivises and captures benefits from the use of biostimulants for soil revitalization. It is applicable for a wide area of technological levels, from low tech land use to industrialized land management, using eligible biostimulants for soil revitalization. As soil management techniques and scientific knowledge of their impact are constantly changing, the methodology does not require a specific agronomic approach but provides flexibility to apply the most current and best-fit systems.

The mode of action of biostimulants for soil revitalization is to act on microorganisms, for example to activate and stimulate the fungal flora (1). As microorganisms play a role in soil carbon sequestration (2), biostimulants for soil revitalization can lead to soil carbon sequestration.

According to Smith et al., 2020 (3), soils have an annual technical potential of 2–5 Gt CO₂/year. Soil organic carbon (the carbon stored in soil organic matter) is crucial to soil health, fertility and ecosystem services, including food production – making its preservation and restoration essential for sustainable development. Soils with high carbon content are likely to be more productive and better able to filter and purify water. Soil organic carbon plays a big role in climate change, presenting both a threat and an opportunity to help meet the objectives of the Paris Agreement (4).

Approximately 33% of the Earth’s soils are already degraded and over 90% could become degraded by 2050 (FAO and ITPS, 2015 (5); IPBES, 2018 (6)). It is thus essential that – while ensuring food security and sustainability – incentives are provided to improve the relevant agricultural practices.

Under this SOC Activity Module, it is strongly recommended that biostimulants for soil revitalization are introduced in project areas in conjunction with sustainable use and/or management of the soil that leads to an improvement in the soil health indicators in the project area throughout the lifetime of the project. Such biostimulants shall be approved and/or registered by the competent authority and their efficacy must be proven by peer-reviewed literature¹ and/or published studies that are based on the activity in the region or comparable region. The Activity Module does not limit any other types of sustainable land land management practices in the

¹ Peer-review publications in reputable journals that are listed in the Science Citation Index Expanded. Peer-review shall cite literature that is relevant to the climate zone.
project areas. Only mineral soil types are eligible and projects can be located anywhere in the world.

This SOC Activity Module recommends the use of approach 1 for baseline and project activity quantification of SOC stocks as described in the SOC Framework Methodology. Approach 1 requires on-site measurements to directly document pre-project and project SOC stocks. Greenhouse gas emissions from the production, transport and application of biostimulants shall be included in the project scenario. Approach 2 may also be applied following SOC Framework Methodology requirements.

A project applicant using this Activity Module may also elect to identify, measure and quantify further beneficial ecosystem services towards other Sustainable Development Goals (SDGs), including but not limited to:

I. Water supply and purification (SDG 6),
II. Zero hunger (food security/stabilization of yield) (SDG 2),
III. Responsible consumption and production (SDG 12),
IV. Life on Land (biodiversity) (SDG 15).

2 | Definitions and References

2.1 | Definitions

In addition to terms and definition listed in the SOC Framework Methodology the following definitions apply for the purposes of this activity module:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biostimulants for soil revitalization</td>
<td>A biostimulant refers to a product (substances and/or microorganisms) independent of the product’s nutrient content that used to stimulate natural processes and metabolism in soil to improve tolerance of abiotic stresses and optimize crop quality, facilitate the availability of nutrients, conditionate the rhizosphere and enhance soil microflora activity.</td>
</tr>
<tr>
<td>Life Cycle Assessment (LCA)</td>
<td>A life cycle assessment (LCA) is a method to evaluate the environmental impact of a product over its entire life cycle. It is a holistic approach that takes into account all the activities involved in the creation of a product, such as raw material extraction, manufacturing, transportation and distribution, use and disposal. For the purpose of this activity module, LCA is based only on the greenhouse gases.</td>
</tr>
</tbody>
</table>
2.2 | References

In addition to the methodologies, methodological tools, guidelines, and key sources listed in the SOC Framework Methodology, this Activity Module refers to the following key resources:


3 | Applicability

3.1.1 | A project applying this Activity Module shall comply with the applicability conditions specified below and within the SOC Framework Methodology. In addition, the project shall comply with applicable Land Use & Forests Activity Requirements (hereafter LUF Activity Requirements) and the Gold Standard for the Global Goals Principles & Requirements (hereafter Principles & Requirements).

3.1.2 | Geographic location

- The activity module is globally applicable, i.e., projects applying this activity module are not limited to particular country or region
3.1.3 | Project area

- The certified Project Area shall be limited to eligible areas, excluding riparian or other buffer zones located within such eligible areas, and excluding areas set aside for conservation in accordance with LUF Activity Requirements.

- This activity module is not applicable on wetlands.

3.1.4 | Soil type

- Proposed projects on sites with organic soils (Histosols), as defined by the World Reference Base for Soil Resources (FAO 2015 (8)), are ineligible. Only mineral soil types are eligible.

3.1.5 | Cropping system

- Managed cropping systems (e.g. single crop or crop rotation) must have been in place for at least 5 years prior to project implementation, i.e. the project does not lead to land use change.

3.1.6 | Soil management practices

- Under this SOC Activity Module, it is strongly recommended that biostimulants for soil revitalization are introduced in project areas in conjunction with sustainable use and/or management of the soil that leads to an improvement in the soil health indicator throughout the project.

3.1.7 | Other criteria

The biostimulants for soil revitalisation eligible under the activity module shall meet the following criteria:

- Biostimulants for soil revitalization shall be approved or registered as a biostimulant or fertilizing product with a biostimulant effect or soil improver function and not as a pesticide by the competent authority.

- Efficacy of the biostimulants for soil revitalization used shall be proven by peer-reviewed research.

- The biostimulant for soil revitalization shall not have an adverse effect on human, animal or plant health, on safety, or on the environment, under reasonably foreseeable conditions of storage or use.

- The biostimulant for soil revitalization may include in its composition material from natural or mineral origin.

- It is strongly recommended that biostimulants production has a minimal environmental impact as demonstrated and outlined in the Section Project scenario, Other emissions (8.2)
4 | Additionality: NA

4.1 | NA

4.2 | NA

5 | Project Boundaries

5.1 | Spatial boundary:

5.1.1 | For spatial boundaries, rules and requirements defined in the SOC Framework Methodology apply.

5.1.2 | NA

5.2 | Temporal boundary:

5.2.1 | The project crediting period shall be between 5 or 10 years, depending on the efficacy of the biostimulant. If the project has a 10 year crediting period, the project shall follow a 5 year certification cycle as per GS principles and requirements.

5.3 | Carbon Pools

5.3.1 | This SOC Activity Module focuses entirely on the soil carbon pool. The project shall account for carbon pools for assessment in line with the SOC Framework Methodology.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Carbon pools</th>
<th>CO₂</th>
<th>CH₄</th>
<th>N₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>SOC</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOC</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Emissions from production and application of biostimulants</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
5.3.2 | Justification for inclusion of carbon pools other than SOC:

- Greenhouse gas emissions from the production and application of biostimulants shall be included in the project scenario. The emissions during production and application of biostimulants are attributed to electricity and/or fossil fuel use.

- Greenhouse gas emissions from transport of biostimulants from production facility to the farm shall be accounted for if the transportation distance is more than 200 km; otherwise they can be neglected.

- Greenhouse gas emissions from production, transport and application of biostimulants can be omitted if they are less than 5% of the net emission reductions and sequestration.

- Greenhouse gas emissions from application of biostimulants can be neglected if the application of biostimulants is through one of the baseline practices and there is no additional use of energy (fossil fuel/electricity). E.g., Biostimulants are applied at the same time as seeding.

6 | Emission Reduction Quantification Approach

Calculations for overall benefits follow the equations set out in Section: Emissions Reduction Quantification Approaches of the SOC Framework Methodology. Sections below specify approaches and calculations specific to this SOC activity module.

6.1 | Approaches for baseline and project scenario quantification

This SOC Activity Module recommends the use of approach 1 for baseline and project activity quantification as described in the SOC Framework Methodology, however, approach 2 may be applied following SOC Framework Methodology requirements.

**Approach 1:** Requires on-site measurements to directly document pre-project and project SOC stocks.

Currently accepted protocols for on-site measurements are the ICRAF protocol (9) and the VCS VMD0021 Module (10). Annex 3 of the 2020 FAO SOC MRV protocol (7) can
be used for this activity module (see Annex 1). Soil sampling must follow best practices, such as those described in Smith & al., 2020 (3) or FAO, 2019 (12).

**Approach 2**: Uses models from peer-reviewed publications to quantify Baseline and project SOC stocks, other emissions reductions, and Project Scenario impact. Project developers shall prove that the research results are conservative and applicable to the project area and management practices using at least 2 peer reviewed papers from journals listed under the citation index.

## 7 | Baseline Scenario

### 7.1 | Baseline Calculations

#### 7.1.1 | Quantification for soil organic carbon in the baseline (SOC\textsubscript{BL,y}) shall follow the rules, approaches, calculations, and parameters set out in Section: Baseline Scenario of the [SOC Framework Methodology](#).

#### 7.1.2 | Eligible baseline scenario calculation approach

Under the additionality and applicability conditions set in the SOC Framework Methodology and this SOC Activity Module, the relevant baseline scenario is the continuation of the historical cropping practices where, in the absence of the project activity, conventional agriculture is done in a business as usual (BAU) manner. To determine the baseline of the eligible project area the land shall be stratified into modelling units (MU) according to:

- Mineral soil type
- Climate zone
- Land management / cropping system
- Input levels (e.g. fertilization)
- Tillage practices
- Any other land management practices (e.g., irrigation)

For each stratum (MU), SOC measurements shall be performed (Approach 1).

#### 7.1.3 | Soil health indicator

The aim of the project activities is to improve soil health. Monitoring of soil health is required at least once at each soil sampling campaign and for each stratum. The project owner shall define a relevant soil health indicator other than Soil Organic Carbon to demonstrate the positive impact of the biostimulants for soil revitalisation on soil health. For the project scenario, the project owner shall monitor the same soil health indicators
as those chosen for the baseline scenario. Examples of indicators from the Section 6 of the Status of the World's Soil Resources (5) are:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Example of indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil erosion</td>
<td>Soil erosion rates (tonnes of soil/ha/year)</td>
</tr>
<tr>
<td>Soil contamination</td>
<td>Quantity of soil contaminants such as metallic trace-elements and radionuclides, and organic compounds like xenobiotic molecules (tonnes/ha)</td>
</tr>
<tr>
<td>Soil acidification</td>
<td>Surface (0-10 cm) and depth (10-30 cm or lower) pH (dimensionless)</td>
</tr>
<tr>
<td>Soil salinization and sodification</td>
<td>Electrical conductivity of the soil (S/m) or exchangeable sodium percentage (dimensionless)</td>
</tr>
<tr>
<td>Soil biodiversity</td>
<td>Presence of macrofauna (number and traces of activity through earthworm sampling) (Number of earthworms per m$^3$ of soil)</td>
</tr>
<tr>
<td>Soil nutrient</td>
<td>Nutrient concentration in soils (such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulphur (S)) (tonnes/ha)</td>
</tr>
<tr>
<td>Soil compaction</td>
<td>Porosity (mass of carbon/m$^3$ of soil)</td>
</tr>
<tr>
<td>Soil-water quantity and quality</td>
<td>Volumetric Water Content (m$^3$/m$^3$)</td>
</tr>
</tbody>
</table>

8| Project Scenario

8.1 | Project Calculations

8.1.1 | Quantification for soil organic carbon in the project scenario (SOC$_t,y$) shall follow the rules, approaches, calculations, and parameters set out in Section: Project scenario of the [SOC Framework Methodology](#).

8.1.2 | Eligible project scenario calculation approach

Under the project scenario, SOC relevant practices are applied in the project area. As with the baseline, the eligible project area shall be stratified into modelling units (MU) according to:

- Mineral soil type
- Climate zone
- Land management / cropping system
- Input levels (e.g., fertilization)
- Tillage practices
For each stratum (MU), SOC measurements shall be performed (Approach 1).

8.1.3 | Soil health indicator

In the project scenario, soil health indicators shall also be measured to monitor the biological, physical, chemical and hydraulic characteristics influencing plant growth. The project owner shall monitor the same soil health indicators as those chosen for the baseline scenario.

8.2 | Other emissions

Project activity emissions consist of greenhouse gas emissions from the production, transport from the industrial facility to the farm, and application of the biostimulant for soil revitalisation. Significant greenhouse gas emissions (>5% of the total) due to the project activity need to be accounted for. Project owners shall calculate GHG emissions using the following approach:

**Life Cycle Assessment**

A life cycle assessment shall be performed that takes into account all the activities involved in the product life cycle including at least production, transport, and application of biostimulants. The life cycle assessment (LCA) of the biostimulant needs to be performed following the latest version of the recognized international standards, such as PAS 2050 issued by British Standards Institute (BSI) (13), GHG Protocol Product Life Cycle Standard (14), ISO standards (ISO 14040:2006 (15) and ISO 14044:2006 (16),ISO 14067:2018 (17).

The project emissions are determined as follows:

\[ \text{PE}_t = \sum^n (A(y) \times Q_{PR,i,t,y} \times LCA_i) \]

Where:

- \( \text{PE}_t \) = total project emissions in the calculation period (t CO\(_2\)e)
- \( A(y) \) = Area of Stratum y (ha)
- \( Q_{PR,i,t,y} \) = Quantity of biostimulant for soil revitalization of type i used, before dilution, in each stratum y in the calculation period (t of biostimulant/ha)
- \( LCA_i \) = Life Cycle Analysis emissions for the biostimulant for soil revitalization of type i [tCO\(_2\)e/t of biostimulant].

The following requirements apply for conducting LCA:

8.2.1. LCA can be performed either by the producer of the product directly, project owner or a third party hired by the producer of the product. Where, the LCA is performed by the producer of the product or the project owner, the LCA shall be independently reviewed.
8.2.2. LCA used by the project owner must not be more than 1 (one) year old from the start date of the project.

8.2.3. LCA shall be repeated at least every 3 years or when there is a significant change (more than 5% of the original process) in the production, transportation or application process of the biostimulant, whichever is earlier.

9 | Uncertainty
9.1.1 | Calculation of uncertainty shall follow the rules and equations set out in the SOC Framework Methodology.
9.1.2 | NA
10| Other Emissions

10.1.1 | Significant additional greenhouse gas emissions (>5% total) due to the project activity need to be accounted for. For this SOC Activity Module, this explicitly includes emissions from increased fertilizer input, fossil fuel combustion, and other agrochemical emissions. Calculation thereof shall follow the rules and equations set out in the SOC Framework Methodology.

10.1.2 | When option 2 (section 7.2.2) is chosen, this explicitly includes emissions from increased fertilizer input and other agrochemical emissions. Emissions from fossil fuel combustion are not included as they are already included in the Life Cycle Assessment.

11| Leakage

11.1.1 | Calculation of leakage shall follow the rules and equations set out in the SOC Framework Methodology.

11.1.2 | For this SOC activity module, leakage from C runoff is considered 0 as projects are not allowed on wetlands. Also, as the project site is being actively maintained for commodity production during the project-crediting period, yield related leakage risks are relatively small. Crop producers are commonly risk averse and are unlikely to intentionally suffer reduced crop yields. Moreover, according to LUF Activity Requirements, projects shall not lead to a decrease in agricultural productivity, thus all projects shall be set up to maintain or increase yield. Thus for initial project calculations, \( LK_{T_0} \) is considered equal to 0.

11.1.3 | If a reduction in yield is detected in a performance certification, it is assumed that the lost production capacity will have to be made up for on land outside the project area. Emissions caused by such a shift shall be accounted for as leakage according to the equation listed in the SOC Framework Methodology.

12| Monitoring

12.1.1 | Monitoring approach and parameters shall be followed as set out in the SOC Framework Methodology.

12.1.2 | In addition to the data and parameters listed in the SOC Framework Methodology, the following parameters need to be monitored and recorded:

12.1.2.1 | Data and Parameters collected for baseline calculation and when project areas (farms/land parcels) are being added.

   a. Data and Parameters fixed
### Data/parameter: Cropland Management Practices<sub>BL,y</sub>

<table>
<thead>
<tr>
<th>Unit</th>
<th>[dimensionless]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Baseline management practices - Cropland management practices (such as tillage, manure inputs, cover crops) before project start in stratum y</td>
</tr>
<tr>
<td>Source of data</td>
<td>IPCC defaults or national / local studies / Farmer own records (preferred)</td>
</tr>
<tr>
<td>Value(s) applied</td>
<td>-</td>
</tr>
<tr>
<td>Measurement procedures</td>
<td>Farmer records. Where farmer records are not available, interviews can be conducted</td>
</tr>
<tr>
<td>Monitoring frequency</td>
<td>Project start</td>
</tr>
<tr>
<td>QA/QC procedures</td>
<td>-</td>
</tr>
<tr>
<td>Additional comments</td>
<td>-</td>
</tr>
</tbody>
</table>

### Data/parameter: Soil health<sub>BL,j,y</sub>

<table>
<thead>
<tr>
<th>Unit</th>
<th>[dimensionless]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Baseline Soil health indicator of type j before project start in stratum y</td>
</tr>
<tr>
<td>Source of data</td>
<td>Farmer own records / Soil analysis / Local data</td>
</tr>
<tr>
<td>Value(s) applied</td>
<td>As per records or pre-project analysis or data.</td>
</tr>
<tr>
<td>Measurement procedures</td>
<td>As per the international or national applicable guidelines for the selected soil health indicator j</td>
</tr>
<tr>
<td>Monitoring frequency</td>
<td>Project start</td>
</tr>
<tr>
<td>QA/QC procedures</td>
<td>As per the international or national applicable guidelines for the selected soil health indicator j</td>
</tr>
</tbody>
</table>
b. Data and Parameters monitored

<table>
<thead>
<tr>
<th>Data/parameter:</th>
<th>LCAi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>tCO2e/kg or tCO2e/L</td>
</tr>
<tr>
<td>Description</td>
<td>Life Cycle Analysis emissions for the biostimulant of type i</td>
</tr>
<tr>
<td>Source of data</td>
<td>Life Cycle Analysis performed by producer or product, project owner or third party</td>
</tr>
<tr>
<td>Value(s) applied</td>
<td>As per the conducted LCA</td>
</tr>
<tr>
<td>Measurement procedures</td>
<td>As per the latest version of the recognized international standards, such as PAS 2050 issued by British Standards Institute (BSI) (13), GHG Protocol Product Life Cycle Standard (14), ISO standards (ISO 14040 (15) and ISO 14044 (16)), ISO 14067 (17)</td>
</tr>
<tr>
<td>Monitoring frequency</td>
<td>Project start, repeated at least every 3 years or when there is material change in production, transportation or application procedure of the biostimulant.</td>
</tr>
<tr>
<td>QA/QC procedures</td>
<td>LCA shall not be more than 1 year old at the start of the project.</td>
</tr>
<tr>
<td>Additional comments</td>
<td>Project owner should provide the latest version of the LCA applicable at the time of start of project and any subsequent performance review and renewal of the crediting period.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data/parameter:</th>
<th>QPR,i,t,y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>t/ha</td>
</tr>
<tr>
<td>Description</td>
<td>Quantity of biostimulant for soil revitalization of type i used, before dilution, in each stratum y in the calculation period</td>
</tr>
<tr>
<td>Source of data</td>
<td>Proof of product use (such as farm accounting, farmer records, product invoice or farmers’ declarations)</td>
</tr>
<tr>
<td>Value(s) applied</td>
<td>As per source of data</td>
</tr>
<tr>
<td>Measurement procedures</td>
<td>-</td>
</tr>
<tr>
<td>Monitoring frequency</td>
<td>Annually</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------</td>
</tr>
<tr>
<td>QA/QC procedures</td>
<td>Cross check that biostimulant use is not more than the prescribed limit. Verifying data entry (such as cross checking farmer records with invoices, where applicable), and analysis techniques, ensuring data maintenance and archiving for project time</td>
</tr>
<tr>
<td>Additional comments</td>
<td>-</td>
</tr>
</tbody>
</table>

### Data/parameter:

**Data/parameter:** Cropland Management Practices<sub>PR,y</sub>

- **Unit:** [dimensionless]
- **Description:** Project scenario Cropland management practices (such as tillage, manure inputs, cover crops) after project start in stratum y
- **Source of data:** Farmer own records
- **Value(s) applied:** -
- **Measurement procedures:** Farmer records
- **Monitoring frequency:** Annually
- **QA/QC procedures:** -
- **Additional comments:** -

### Data/parameter:

**Data/parameter:** Soil health<sub>PR,j,y</sub>

- **Unit:** [dimensionless]
- **Description:** Project scenario, Soil health indicator of type j during project scenario in stratum y
- **Source of data:** Soil analysis
- **Value(s) applied:** As per the soil analysis
- **Measurement procedures:** As per the international or national applicable guidelines for the selected soil health indicator j
- **Monitoring frequency:** At every performance certification cycle, preferably annually
- **QA/QC procedures:** As per the international or national applicable guidelines for the selected soil health indicator j
Annex 1: Rationale for the inclusion of Annex 3 of the 2020 FAO SOC MRV protocol

Annex 3 of the 2020 FAO MRV Protocol (7) has been developed through an extensive research and consultation process, involving scientists, policy makers, FAO Members, and international and intergovernmental panels. It provides a standardized tool to support SDG 15.3.1., as well as any project related to SOC sequestration.

The objective of the 2020 FAO MRV Protocol is to provide a conceptual framework and standard methodologies for the monitoring, reporting and verification of changes in SOC stocks and GHG emissions/removals from agricultural projects that adopt sustainable soil management practices at farm level in different agricultural land and for any type of crops.

Below is a comparison between Annex 3 of the 2020 FAO MRV Protocol (7) (the “FAO protocol” thereafter) and the currently accepted protocols: the ICRAF protocol (9) and the VCS VMD0021 Module (10) (the “VMD0021 protocol” thereafter).

Compared to the ICRAF protocol (9), Annex 3 of the 2020 FAO MRV Protocol (7) can be more adequate for some carbon projects because the sampling design requirements have been chosen for soil carbon monitoring at farm level and not landscape level.

For sample size determination, the FAO protocol uses a similar equation to VMD0021. Sampling design, the FAO protocol allows for stratified simple random sampling (similar to ICRAF and VMD001 methodologies) and directed stratified sampling designs.

Composite samples are required, as in ICRAF and VMD0021 methodologies. As a minimum, samples for SOC concentration determinations shall be obtained from 0-10 cm and 10-30 cm with the FAO protocol. However, samples from deeper layers up to 1 m can be collected. The ICRAF protocol recommends 0-20 cm and 20-50 cm depth and the VMD0021 protocol recommends a sampling depth higher than the depth great enough to capture at least 90% of the expected change in soil carbon, with a maximum of 2 m.

Sampling frequency must be as a minimum every 4 years (no direct recommendations on this in ICRAF or VMD0021), and samples must be taken at the same time of year, as in VMD0021.

Last, for estimating bulk density, direct measurement methods shall be used, specifically the undisturbed (intact) core method and the excavation method, while the ICRAF protocol recommends recovering soil from augered samples for ease of use, and the VMD0021 does not require a single methodology as long as the soil sample is undisturbed.