



Expert Peer Review for Ecometric

Methodology for Methodology Proposal for Soil Organic Carbon Estimation in Regenerative Cropping and Managed Grasslands Ecosystems

Summary of Internal Review Process

The intent of the [Expert Peer Review](#) is to ensure methodologies meet the integrity expected by our community and ensure the methodology will work to regenerate ecosystems. The task of an Expert Peer Reviewer is to act as an ally to methodology developers by providing critical feedback to help facilitate an understanding of how to improve the methodology to best serve Earth Stewards while maintaining scientific and community integrity.

The *Methodology Proposal for Soil Organic Carbon Estimation in Regenerative Cropping and Managed Grasslands Ecosystems* has been reviewed and feedback has been provided in two ways:

- 1) **Overall Reflections:** To provide more feedback to your methodology, comments and additional reflections are recorded in this document.

Expert Peer Review:

The purpose of this report is to assist strengthening the proposal and promote thinking resulting in improvements.

General Comments:

1.1

It would be useful to put the perspective of ecometric as to why the SOC is the way to measure "soil ecological health indicator". This will be a useful argument as to why only SOC and why describing it as "ecological health". This is a soil health characteristic but one of many. Perhaps because it is directly relevant to carbon.

I have introduced the FAO context of: SOC is crucial to soil health, fertility and ecosystem services including food production, making its preservation and restoration essential. This methodology will concentrate on the assessment of SOC sequestration as a major soil health characteristic, consisting of:

1.2

Perhaps here it should be mentioned if this is intended to state a negative or positive statement. There will not be implication for any negative results. From an agronomic point of view farmers want high SOC as it is a positive outcome for them. However, this can be linked to a higher emission of NO_x or retain diseases etc. Cultivations can encourage SOC reduction by oxidation or soil aggregate breakdown. In a forest for instance this can mean something different to that of the farmed land.

I have not commented here as we have not yet gathered enough data to build sufficient understanding of potential negative effects of increased SOC. One of our soil management support aims is to work with the farm management team to build understanding of the relationship between SOC, nitrogen use efficiency and yield which will identify positive and negative effects of SOC on productivity.

1.3

If someone has good records of SOC levels historically, could they use an earlier timeline for the baseline? It is understood that the same can be performed by soil samples alone however the technology offers to do this cheaply and in a larger area.

Added: In the event that historic SOC data meets this methodology's sampling and laboratory analysis requirements, it may be used to calculate a historic baseline.

2.1

It is somewhat an expectation that a farmed/managed land is carbon neutral before carbon credits can be issued. Does that mean that the boundaries should take into consideration the operations in the land rather than a specific selection? For instance, a mix farm, cattle and crop decide to use as boundaries only the fields of crop that are not performing well and they decided to make some

changes. However, that may not change that the farm overall is long way from getting to carbon neutral. Therefore, the boundaries should be defined in a clear way so that selectivity/bias is not picked upon by external audience.

The eligibility criteria defined in the credit class (CC) document, will determine project boundary rules. Our methodology document defines only how we measure SOC stock change and not how we convert this into a net-carbon figure, so this document does not need to be amended. The CC document allocates whole-farm emissions against any sequestration gain, with the exception of diversified activities which can be ringfenced as separately identifiable businesses. This creates the principle of only trading climate positive surplus carbon gains, ensuring the farm business has surpassed net zero before selling carbon. The CC and Project Template document define and record adherence to project boundary eligibility criteria.

2.2

Similar to the above, there may be some practices that increase SOC considerably however that may not be lasting. For instance, the increase in plant residue, mulching and application of manure etc. can have a significant impact depending on timing of application and measurement of SOC. Therefore, a better proposition of the SOC stock measurement should be in place so that this is not picked up as a weakness. For instance, the starting point can be at a time of the year that there are no crops in the field and then end point is soon after incorporation of manure, Stable and mulching of a cover crop. This will most likely show up as high SOC but that SOC will eventually breakdown and not contribute to the long term SOC. Some long-term check points should be in place or somehow demonstrate that these practices add specific long term benefit by adjusting the benefit using historic data.

Added: Sampling will be conducted at 12-month intervals to ensure temporal comparability and will follow laboratory guidelines on advised time delays after the application of organic or inorganic fertilizer. Annual monitoring of SOC stock change will inform the long-term effect of nutrient and crop residue incorporation strategies which will be reported as a change graph to allow easy vector visualization and diagnosis.

3.1

To strengthen the background a table showing the publications and their validity would be useful to include impact factor of the journal, number of citations, University/company, year, etc. This is particularly useful if econometric is using some of that work to build upon their model.

The number of citations has been added to the bibliography to show the importance of each cited work.

3.2 sample x 2 repeated... grammatical.

Corrected

3.3

The publications used are not adequate to base the methodology on however a good support. If the group has any publications on the work, it would be a great addition.

See 3.1 above.

Explaining how the stochastic part of the NNT can be smoothened would be useful as the data input will not change.

There will be several examples published that have used this, so I encourage that these are referred to.

The network training process relies on the stochastic (randomness) to optimise the result.

Is there a way that the system can check against values that would be expected to ensure that there is some further check. For instance, practice A in farming is expected to provide an additional 0.3% SOC (known for work performed over decades). If the model suggests something much higher or lower, then it should be sending a signal for human check with an error.

3.4

The depth of the soil samples is not clear. The SOC can vary greatly depending on the soil type and cultivation practices. Typically, 0-30cm is considered the most important and that is split in two 0-15cm and 15-30cm. Also, making composite samples, meaning that you have multiple points within a small area, and you mix them together to avoid a point inaccuracy. Again, the timing of the first sample has to be chosen correctly to avoid bias.

The way that the SOC will be analysed in the lab should be described. If there is a way of measuring old and fresh SOC would be great as another indication that this is a lasting effect.

Added: Soil samples will be taken to a depth of 0-30cm, with all cores gathered within each strata composited into a single sample to avoid point inaccuracy and reduce cost. The DUMAS dry combustion laboratory test will be used exclusively for the direct measurement of SOC %.

3.5.1.

It is great that the location of the subsequent sampling remains the same.

3.5.2

It appears that the ancillary data will be an important part of the system as it can alter the results. Would the end use be able to find out as a prediction what would happen to a specific situation if the follow up certain practices and changes? This may prevent for some type of soils and locations any changes to take place as they might be negligible in terms of the positive result they offer.

No change made, it is our future intention to use knowledge gained on soil type, crop type and management system to predict future change, but we do not yet have enough data.

The reference to the seasonal data is very welcomed however the statement at the end of the section where the dates are within a month, I believe is restrictive unless referred to other data than the seasonal.

3.5.3 The sampling methodology is robust and appropriate.

3.5.4.

Is there any adjustment required for the SOM/SOC measurement that may be affected by core collection? If there is a notable difference in some soft soils i.e. recently prepared then some adjustment may be appropriate. Perhaps account for variations that will most likely exist after cultivations compared to when a crop is established.

Given the use of multiple contractors our judgement was that a single core collection method was the only way to ensure consistency. We work with our contractors to build awareness of dry soil loss from the corer on extraction and to record and report unusual or unexpected soil conditions that may affect results. Our QA process would pick up unexpected laboratory results which trigger laboratory retest requests, which also guards against unusual soil conditions or inconsistent laboratory sample preparation resulting in apparent SOC quantity change that doesn't represent true values.

3.5.5

Imagery source: it would be great to have some references published where this was used successfully and accepted as a way of measuring the parameters of interest. At 0.4 meter/pixel there may be some questions about the resolution for certain measurements.

3.5.6

If the data comparison is a few months only for deciding on the changes occurring during the period of the project, then the +/- 4 months period for the images may be inappropriate. I would advise to consider how this can be managed. Positive results may not be showing as should in such case.

Added: as close as possible to the sampling date but within +/- 4 months of the sampling date. This states our intention to always source imagery as close as possible to the soil sampling date while giving some flexibility during periods of persistent cloud cover. Over the last 24 months we have always managed to source imagery with 1 month of sampling date, so this has not caused an issue in the temperate climates of UK, N Europe or NZ.

3.5.7-3.5.9

The more data is added to correct/train the system the better. Consider a potential come back to projects after i.e. 3-5 years for any corrections.

3.6-3.7.2.

Comparing the prediction to the lab samples is essential to test the correctness of the predictions and data used to reflect SOC values.

3.7.3.

Build some upper/lower values that automation has as checks so that it doesn't produce irrelevant figures.

4.1

This is fine as long as parameters that can affect the SOC stock at baseline measurement are taken into account.

4.2-4.3

This is acceptable. Perhaps use the latest EU database for equivalent CO₂ and provide the reference.

Sorry, I don't understand this comment?

4.4

Uncertainty of 20% is somewhat significant so I would expect that even a small percentage would be reduced. I would suggest at 10% no reduction but at 10-20, a reduction of 5-10%.

The uncertainty boundaries have been changed to fall in line with this comment.

A quality control for the imagery received so that there are no potential errors given that they are important for the calculation may be proposed. Perhaps at initial stages several sources of the imagery should be used to observe and report variations.

The image quality control is carried out by EOS.

Final Decision: - Pass or Suggested for another round of Review

The comments and suggestions in this review are proposed to strengthen the methodology and consider what may be asked by others commenting on the methodology when approved and used. I will be happy to take a look on amendments proposed by this review or others and have another round of review for any further constructive feedback.