CARBON REMOVALS EXPERT GROUP TECHNICAL ASSISTANCE

Draft for the Agricultural land Technical Assessment paper

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Partners for Innovation B.V. (PfI)
Withoedenveem 8
1019 HE Amsterdam
The Netherlands

Wageningen University and Research
Wageningen Environmental Research (WEnR)
Droevendaalsesteeg 3
6708 PB Wageningen
The Netherlands

Contact persons:
Peter Karsch, Partners for Innovation B.V.
Tel. +31-20-6200511 / +31-6-20607579 (mobile), e-mail: p.karsch@partnersforinnovation.com

Jan Peter Lesschen, Wageningen Environmental Research
Tel: +31-317-484687, e-mail: janpeter.lesschen@wur.nl

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Executive Summary

Background and objective

The provisional agreement on the regulation on ‘establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products’ sets out a voluntary EU-wide framework to certify carbon removals and soil emission reductions in the EU. It focuses on criteria to define high-quality carbon removals and soil emission reductions, and addresses the processes to monitor, report and verify the authenticity of these removals and reductions. The EU carbon removal certification framework will ensure transparency, environmental integrity, and prevent negative impacts on biodiversity and ecosystems. The objective is to provide assurance about the quality of the carbon removals and emission reductions and make the certification process reliable and trustworthy to combat greenwashing. This Technical assessment paper discusses criteria and methods that can contribute to this for carbon farming activities on 'Agricultural land'.

Approach

The input for this technical assessment paper is based on i) the CRETA review on carbon farming methodologies (July 2023), ii) reports and scientific articles, iii) input from the Technical Focus Group discussions and iv) input from relevant research programs. In the process of developing this Technical Assessment paper for agricultural land, CRETA acquired expert input from experts on specific topics. The Focus Group members were subsequently asked to provide in-depth knowledge and their views on the three Technical Assessment papers regarding the advantages and disadvantages of different certification approaches during thematic meetings based on the quality criteria of: quantification; additionality; storage, monitoring, and liability; and sustainability. The experts participating in the Focus Groups were selected by CRETA and DG CLIMA in close consultation with the Expert Group on Carbon Removals.

Instructions for the summary table

The executive summary table below provides for each section the most important topics that were addressed in the Focus group meetings. For each topic, preliminary findings and next steps are described. The last column with colours gives an indication if the findings were supported by a clear consensus in the Focus group (green). In case of some doubts or partial consensus, yellow was used; orange was used for topics that required further elaboration before a decision can be made.

DEFINITION OF CARBON REMOVAL ACTIVITIES				
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
2.2	**Inclusion of agro-forestry**	Inclusion of agroforestry in the agricultural land methodology (rather than in forestry methodology)	Design a module on agro-forestry with MRV approach borrowed from forestry methodology	
2.3	**Inclusion of biochar in agri methodology**	Preference of focus group for inclusion of biochar under the methodology for agricultural land management (rather than permanent carbon removal methodology)	Propose detailed guidance on application and sourcing of biochar and alignment with other methodologies	
2.4	**Eligibility criteria**	Criteria-based approach was preferred to specific list of eligible practices	Propose specific eligibility criteria	
2.5	**Definition of the carbon pools**	Minimum sampling depth at 30 cm, but in the case of no/reduced tillage also look at sub-soil	-	
QUANTIFICATION				
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
3.2	**Quantification approaches for soil carbon stock changes**	Hybrid approach combining soil sampling, modelling, and remote sensing, in line with CIRCASA recommendations. Set out criteria on transparency and accuracy of measurements rather than imposing forward specific measurement techniques.	Propose specific technical MRV rules	
3.3	**Quantification of 'soil emission reduction' / 'carbon removal'**	This topic was not discussed at the Technical Focus Group meetings. In the provisional agreement the distinction between carbon removals and soil emission reductions is explicitly included, but for the development of the methodology, this topic that to be addressed, as it has implications for the quantification approach.	Propose rules in line with the quantification approach	
3.4	**Quantification of the direct and indirect emissions**	Direct emissions: based on IPCC guidance. Indirect emissions from land use change: complex and not big magnitude, so avoid extensive data collection	Propose specific rules, to be aligned with RED approach when relevant	
3.5.2	**Standardised baseline**	Hybrid approach with different types of data (national, regional, local and activity-specific data) to be incorporated in the standardised baseline	Work further on the rules and on collection of default values	

3.5.3	**Activity-specific baseline**	Reference period of 3-5 years covering start and end of crop rotation. Measurement of activity and baseline should be comparable.	Propose specific rules on how to deal with LUC not captured in the baseline.	
3.6	**Quantification of statistical uncertainty**	Express uncertainty at the level of a project (i.e. group of operators). Use the "probability of exceedance" approach. Tiered approach: use a default uncertainty factor with higher discount, and a lower discount can be used if the uncertainty is proven lower.	Propose threshold and specific rules for the probability approach.	
		ADDITIONALITY		
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
4.2	**Additionality rules in case of an activity-specific baseline**	Low trust in financial additionality tests, in carbon farming non-financial barriers are more important. Allow public co-funding and sharing of financial risks.	Propose additionality tests, building on the existing RED implementing rules; consider how to integrate a 'common practice test'.	
		STORAGE, MONITORING AND LIABILITY		
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
5.2	**Minimum duration of the activity period**	Short activity period (e.g. 5 years), but in grassland / perennial cropping systems it could be longer than in arable systems.	Propose specific activity periods for different types of farming activities.	
5.3	**Minimum duration of the monitoring period**	No consensus whether monitoring period should be the same or longer than activity period.	Propose for discussion specific monitoring periods for different types of farming activities.	
5.4	**Rules for liability mechanisms**	Use a buffer pool approach, possibly combined with other mechanisms (e.g. insurance products).	Propose specific rules on the buffer pools, including thresholds associated to risks of reversal.	
		SUSTAINABILITY		
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
6.2	**Minimum sustainability requirements**	Use a negative list of practices that risk harming the sustainability objectives. Avoid metrics that imply additional data collection. Quantitative assessment can be applied in case no additional data collection is needed.	Build on Taxonomy DNSH and other EU approaches, propose specific minimum sustainability requirements for different activities.	
6.3	**Mandatory co-benefits for carbon farming & monitoring and**	Combination of on farm data collection, remote sensing (e.g. crop diversity, landscape features, agro-ecological practices), and modelling	Building on the IMAP database, propose positive list of activities	

	reporting of co-benefits	(nutrient/sediment run-off, surface and groundwater withdrawals).	providing biodiversity co-benefits Building on existing best practice develop rules a cost-effective and scalable methodology for quantitative co-benefit monitoring.	

1 Introduction

The Carbon Removals Certification Framework (CRCF) regulation will set out a voluntary EU-wide framework to certify carbon removals and soil emission reductions in Europe. It focuses on criteria to define high-quality carbon removals and soil emission reductions, and addresses the processes to monitor, report and verify the authenticity of these removals and reductions. The EU carbon removal certification framework will ensure transparency, environmental integrity, and prevent negative impacts on biodiversity and ecosystems. The objective is to provide assurance about the quality of the carbon removals and emission reductions and make the certification process reliable and trustworthy to combat greenwashing.

In this technical assessment paper, we discuss the potential elements of a certification methodology for carbon removals and emission reductions on agricultural land. The report is structured according to the QUALITY criteria and the elements to be included in the certification methodologies as listed in Annex I of the provisional agreement on the regulation. For these elements, the different potential approaches are described, and advantages and disadvantages are outlined.

The input for this technical assessment paper is based on i) the CRETA review on carbon farming methodologies (July 2023)[1], ii) reports and scientific articles, iii) input from the Technical Focus Group discussions and iv) input from relevant research projects, e.g. the Soil Mission projects (MARVIC, MRV4SOC and Credible).

In the process of developing this Technical Assessment paper, CRETA acquired input by forming three ‘Focus Groups’ comprising experts on the certification of carbon removals in Agriculture on mineral soils, Forestry and Peatlands respectively. The Focus Group members were subsequently asked to provide in-depth knowledge and their views on the three Technical Assessment papers regarding the advantages and disadvantages of different certification approaches during thematic meetings based on the QU.A.L.ITY criteria. In total, four Focus Group (FG) meetings were organised in the period October 2023 – January 2024 on the following topics:

- 1st FG meeting: 06-10-2023: Carbon activities and carbon pools
- 2nd FG meeting: 24-11-2023: Quantification
- 3rd FG meeting: 08-12-2023: Long-term storage and Sustainability
- 4th FG meeting: 26-01-2024: Baselines and Additionality

The experts participating in the Focus Groups were selected by CRETA and DG CLIMA including suggestions of the Expert Group on Carbon Removals. The Expert Group was kept up to date of the progress of the Focus Groups by providing the meeting minutes and updates on the Basecamp platform that is used by CRETA to organise the interaction with the Expert Group members. The meetings consisted of a plenary session with a short introduction and a breakout session for the three types of carbon farming for which Technical Assessment papers are developed, followed by a plenary session to exchange the outcomes. The breakout sessions were chaired and documented by CRETA team members, whereas DG CLIMA policy officers were present to answer any regulatory questions regarding the framework proposal. For each topic, CRETA had formulated key questions that needed to be clarified to further develop the Technical Assessment papers and formed the basis for the discussion. The outcome of the meetings is referred to in this Technical Assessment paper in the respective chapters.

[1] The main input in terms of methodologies included in the review originates from a survey that was conducted through the EU Survey website in April-May 2023. This covered most relevant methodologies and only few other methodologies were added to the assessment.

It is important to note that all the discussions underpinning these papers happened before the conclusion of the co-decision process on the voluntary framework for certifying permanent carbon removals, carbon farming and carbon storage in products. As a result, some important elements that are in the provisional agreement are not reflected in the discussions. Nevertheless, the authors have tried their best to make sure that all references to the legal text are aligned with the text of the provisional agreement.

Article 8 of the CRCF Regulation requires that the methodologies should minimise the administrative burden for operators, particularly for small-scale carbon farming. This means that the trade-off between robustness of carbon removals versus the complexity of the methodology will be an important aspect in the assessment. The technical assessment papers will be used as a starting point to decide on the best practices that should be included in the writing of the strawman proposals in late 2024.

This document was discussed during the 4th Expert Group meeting on carbon removals and carbon farming in April 2024. In addition, the EG members had the opportunity to give feedback to the Technical Assessment Papers afterwards. This feedback is summarised in this document at the end of the respective chapters, and will be used to shape the next steps in the development of the certification methodologies. This process will involve more dedicated meetings and interactions, and will result in the preparation of "strawman" certification methodologies (i.e. first drafts of the certification methodologies intended to generate discussion and gather feedback), to be shared in advance of the 5th meeting of the Expert Group (likely in October 2024).

2 Carbon removal activities

2.1 Introduction

This Chapter is about the definition of the carbon removal activities (Annex I, point (a) in the provisional agreement on the regulation) that should be considered under the agricultural land management methodology. We identified three main questions.

1. Scope of the carbon pools to be included: should this methodology only focus on changes in SOC stock of mineral soils, or should it also include changes in biomass of agricultural activities (e.g. agroforestry, perennial crops and landscape elements)?
2. Use of biochar: should biochar be certified at the level of the land manager (because of the increase in SOC stock), or should the certified units be attributed to biochar production (as a form of carbon storage in products) subject to a separate methodology?
3. Should the methodology have criteria to exclude specific soil management practices due to the uncertainty about their effectiveness?

These three topics are further elaborated below.

2.2 Agro-forestry

Definition	Description of the activity 'Carbon farming – Agricultural land' *Related to Annex I (a) type of activity and description of the practices and processes covered, including its activity period and monitoring period;*
Issue	Agroforestry, woody perennial crops and landscape elements are mostly related to carbon removals in biomass. Quantification of carbon stock changes in biomass requires other quantification approaches compared to soil organic carbon stock changes. The quantification approach could be more similar to the ones that are used in forestry, although traditional forest inventories do not include these kind of trees on agricultural land. **Key question:** Should practices that increase carbon stocks in biomass on agricultural land (agroforestry, woody perennial crops, hedges) be included in the agricultural land methodology?
Objective	A comprehensive but reliable methodology, while minimizing administrative costs of MRV (i.e. separate methodologies vs. single methodology with a broader scope)
Existing certification approaches	The review of existing methodologies found that only a few of the existing methodologies include agroforestry (**Soil Capital** and **Climate Farmers**). Only one specific methodology was found for perennial crops (**Label Bas Carbone – Plantation de vergers**) and one for landscape elements (hedges) (**Label Bas Carbone – Haies**). VERRA does not include agroforestry, but allows to stack different methodologies, i.e. one for soil and one for the biomass. Agroforestry is mainly contributing to carbon removal due to carbon stock changes in biomass. SOC sequestration is likely to occur when agroforestry is

	introduced in arable systems, but in silvo-pastoral systems there might even be a loss in soil carbon (e.g. Cardinael et al., 2017)	
Options:	Pros	Cons
Include as part of agricultural land methodology	• Might stimulate land managers to choose for agroforestry besides other C removal practices • For land managers and project developers it is easier as only a single methodology has to be used • Aligned with existing methodologies, e.g. in France and Ireland they do include agroforestry and hedgerows in the agriculture methodology	• Methodology becomes more complicated, as also C removal in biomass must be included • C sequestration in biomass is more related to forest methodologies • Limited methodologies are currently available
Include as part of forestry methodology	• The methodology for quantification is more similar to the forestry activities, as it deals with carbon stock changes in biomass	• Agroforestry is part of the agricultural system and these trees are often not included in forest inventories • Agriculture and forestry are often different communities and land owners
Separate methodology	• For specific agroforestry projects a targeted methodology taking the relevant elements of the agricultural and forestry methodologies could be efficient (fit for purpose)	• Interaction with other C agricultural practices is not taken into account • The administrative burden will be higher if land managers want to combine agroforestry with other practices • The SOC measurements do not allow to make a distinction between SOC changes due to agroforestry or due to other practices
Preliminary findings	Overall, most of the experts of the focus group were in favour of including the agroforestry in the agricultural land methodology for practical reasons using a modular approach to combine or chose activities. The main arguments were: i) to reduce the administrative burden for farmers/project developers; ii) to ensure possible combination with other agricultural practices, iii) SOC measurement do not allow differentiation between agroforestry and other practices and iv) the biomass quantification could be added as a separate module in the methodology.	

2.3 Biochar

Definition	Description of the activity 'Carbon farming – Agricultural land' *Related to Annex I (a) type of activity and description of the practices and processes covered, including its activity period and monitoring period;*	
Issue	The production of biochar is a carbon dioxide removal method that imitates the geological organic carbon pathway, using controlled pyrolysis to rapidly carbonize and transform biomass into stable carbon, also named inertinite maceral, that can be used for permanent storage (Sanei et al., 2023). Biochar can be applied to the soil and might have positive aspects on soil quality although these positive effects are soil type and climate dependent (e.g. Jeffery et al., 2017). There are in principle two approaches to certify the application of biochar in agricultural soils: either the application of biochar and the related increase in SOC stocks is certified as a carbon farming activity (i.e. the certified operator is the farmer), or it is considered as a form of carbon storage in product (i.e. the certified operator is the biochar producer) **Key question:** Should biochar application be part of the carbon farming methodology on agricultural land management, or should it be considered as carbon storage in products?	
Objective	A comprehensive but reliable methodology, while minimizing administrative costs of MRV (i.e. separate methodologies vs. single methodology with a broader scope)	
Existing certification approaches	• The review of the existing methodologies did not include any specific biochar methodologies under agricultural land management. Biochar was not mentioned explicitly as one of the eligible practices in the reviewed methodologies applied at scale, although it was mentioned for few pilot methodologies. • Two specific methodologies are available for biochar (Verra and Puro earth), which were not included in the review. In both the **VERRA biochar** methodology and the **Puro earth Biochar** methodology the certificates are linked to the production of biochar and not to the application in the soil. • In the LIFE Carbon Farming Scheme the Puro earth methodology was applied, and revenue of the credits was divided equally between the industrial supplier of the side stream material, the processing company, and the farmers who apply the soil improver in their fields. • In the **Esca methodology of the RED** ((EU) 2022/996) the use of biochar is mentioned, but without any further specifications. In that approach the SOC stock change is mainly based on measurements and the carbon in the biochar would be included as part of the stock change.	
Options:		
Biochar application as practice to increase SOC stocks is certified as a carbon farming activity (i.e. the	• In default SOC measurements, it is impossible to disentangle the effects of biochar application from other practices / carbon inputs	• More complicated to allow certificates for biochar producer and/or biomass supplier • SOC measurements are costly and have high uncertainty

farmer is the certified operator)	• Biochar is already included as a sustainable agriculture management practice in the REDII implementing regulation • Biochar is also part of SOC stock changes in national LULUCF inventories	• Quantification based on SOC measurements might be complicated, while amount applied is well known • Might be more difficult to ensure sustainable supply of the biomass for biochar production
Biochar is part of carbon storage in product (i.e. the biochar producer is the certified operator)	• Certificates can be easier divided over producer, supplier and user of the biochar • Easier to certify as there are less operators involved, and the amount of biochar produced is easy to quantify.	• Less attractive to farmers if most of the revenues from the certificates are for the biochar producer. Although biochar might have positive effects on other soil properties • Risk on double counting if biochar is used on fields that are also part of carbon farming certification
Preliminary findings	General consensus was that biochar should be included under the methodology for agricultural land management to ensure consistency between regulations, but double-counting should be avoided. Detailed guidance, related to the application (e.g. biochar should be incorporated to prevent increased albedo effects) and sourcing of the biochar (good quality without contaminants and sustainably sourced biomass, i.e. certified biochar), is required. For quantification a separate approach should be used, as normal soil measurements and soil carbon modelling are not appropriate for biochar application. Alignment with the methodology development for Carbon Storage in products is required for this practice.	

2.4 Eligibility criteria

Definition	Description of the activity 'Carbon farming – Agricultural land' *Related to Annex I (a) type of activity and description of the practices and processes covered, including its activity period and monitoring period;*
Issue	How specific should the methodology be in defining the practices that are eligible as a carbon farming activity? For both arable land and grassland, there are many practices that can be used to increase SOC stocks. However, their effectiveness is often location specific, depending on soil type, climate and current crop and soil management. In scientific literature, the potential for carbon sequestration is therefore uncertain and often a wide range is found. For instance, the effectiveness of no/reduced tillage as SOC sequestration is being discussed. In the JRC meta-review exercise (IMAP)[2], they found that 19 out of 28 meta-reviews on no/reduced tillage found a positive impact on SOC. It seems that in drier climates it has a positive effect on SOC, but in more humid

2 https://wikis.ec.europa.eu/display/IMAP/No+tillage+and+reduced+tillage_Impacts_Carbon+sequestration?preview=/48760697/48760696/No%20tillage%26Reduced%20tillage_Impacts_Carbon%20sequestration.pdf

	climates the effect is often not significant (Sun et al., 2020). However, many of these studies only looked at the topsoil. There is a more recent discussion in the effectiveness of reduced and/or zero tillage when taking also the subsoil into account, as it might be more a redistribution of carbon (more in the topsoil, but less in the subsoil) then net sequestration (e.g. Haddaway et al., 2017). Dilemma is that measurements might show the increase in the topsoil, but that the net mitigation effect is close to zero if there is a loss in the sub-soil. For organic amendments (manure, compost) there is discussion whether these practices are not only displacement of SOC sequestration. Organic amendments have a positive effect on SOC and soil health. However, in Europe most manure and compost are already used and only little is lost (e.g. due to incineration). This means that adding more compost or manure will result in less manure/compost applied in another place. This means that at regional scale the effect on SOC might be close to zero. **Key question:** Which approach is more appropriate for the exclusion of potential ineffective SOC practices: a criteria based approach, or a negative list (certain practices are excluded beforehand).	
Objective	An approach to decide on the inclusion of exclusion of types of SOC practices to be certified. The approach could be based on criteria or on the exclusion of specific practices.	
Existing certification approaches	Most methodologies do not seem to exclude any SOC practices beforehand and many mention a large list of possible practices in the survey. Some methodologies, e.g. **Verra VM0042** v2.0, account for leakage, from new application of organic amendments from outside the project area. This should ensure the organic amendment is additional, thus not replacing current application elsewhere (e.g. compost production from organic material that is currently disposed in landfills or burned).	
Options:	Pros	Cons
Use criteria-based approach	• Effectiveness of practices is location and context specific • A criteria-based approach would be more long-lasting than a practice-based approach, as a lot of new knowledge is being developed about the effectiveness and trade-offs/co-benefits of carbon farming practices	• More complex, higher administrative burden • If only high-level criteria are formulated, it might not detect sufficiently potential negative effects.
Exclude specific practices (negative list)	• Simple approach, as it requires no development and interpretation of criteria • More certainty on real carbon removals, as only well-proven practices are eligible	• Effects of practices are often context specific and cannot be generalised • Difficult to establish a widely supported list of practices that are not eligible
Preliminary findings	A criteria-based approach is preferred over a list of certified practices. This approach could be related to the minimum sustainability criteria and potential lower effectiveness of a practice should be reflected in the quantification methodology. Specific suggestions:	

	• For organic amendments you might add criteria, e.g. only additional application in soils that are low in OM • For organic amendments only sourcing in the region, • To prevent leakage ensure the whole farm is included in the certification and prioritise the practices that increase NPP (net primary production) • Need to look at the specifics of each measure, e.g. herbicide use for reduced tillage

2.5 Carbon pools

According to the provisional agreement on the regulation all biogenic carbon pools, i.e. above-ground biomass, below-ground biomass, litter, dead wood and soil organic carbon, should be considered. Litter and deadwood are only relevant pools for forestry, but not for agricultural land. As was discussed in Chapter 2.2, agroforestry and perennial crops should be part of the agricultural land methodology. This means that also the biomass carbon pool, both below and above ground, should be part of the methodology. For these pools there are existing guidelines from the IPCC for quantification and also some methodologies provide quantification approaches. However, most focus and discussion is on soil organic carbon. For soil organic carbon it is important to define the depth of the soil that will be considered in the certification methodology, this aspect is discussed below.

Definition	Definition of the depth that the mineral SOC pool should comprise in the methodology for agricultural land. *Related to Annex I (b) rules for identifying all carbon removal sinks and GHG emission sources referred to in Article 4(1), (2) and (2a)*
Issue	The scope of the carbon pools that will be quantified for carbon certification has to be defined for the methodology. For mineral soils there is discussion on which soil depth should be used. Should this be limited to the topsoil (0-30 cm) or can carbon sequestration in deeper soil layers also be included? Related to this question is also the issue of equivalent soil mass. As soil measurements often only provide information on SOC content, the bulk density is required to calculate SOC stocks. However, some carbon farming practices might also affect soil bulk density, for which ideally the sampling depth should be adapted to sample the same amount of soil, this is called equivalent soil mass (Wendt and Hauser, 2013). However, this issue has not been discussed during the focus group meeting, but is something to take into account for the further development. **Key question** Should the methodology be limited to topsoil (0-30 cm) SOC stock changes?
Objective	Clear criteria for the scope of the soil organic carbon pool, for which carbon stock changes can be certified in the methodology.
Existing certification approaches	Most methodologies only consider SOC in the topsoil, often defined as the layer 0-30 cm. Most soil sampling protocols require taking soil samples to 30 cm. **CAR's SEP** and the **FAO GSOC protocol** recommend sampling to one meter, though it is not required.

	Verra's VM0042 v2.0 requires reporting of SOC stocks and stock changes to a minimum depth of 30 cm. To eliminate the need for extrapolation outside of the measured range, soils must be sampled deeper than the minimum 30 cm required for reporting SOC stock changes. A minimum sampling depth at 30 cm or deeper is also stated in the IPCC guidelines and used for most National inventories.	
Options:	Pros	Cons
Limiting methodology to topsoil (0-30 cm)	• Lower soil sampling cost • Currently used in most methodologies • Aligned with most current soil sampling programmes (e.g. LUCAS) • Most SOC increase will occur in topsoil • Most SOC model only simulate the topsoil	• For some practices, e.g. deep rooting crops, SOC sequestration potential is expected in the subsoil, where it might be more stable, which would not be included. • Some practices increase SOC in topsoil but might result in a decrease in the subsoil, which would overestimate mitigation potential
Extend scope to also include subsoil	• Provides best estimate of actual carbon removals • Some practices, e.g. reduced tillage, might have increase in the topsoil but decrease in subsoil, which would be covered	• Soil sampling cost will be higher • Uncertainty will be higher as variability in the subsoil might even be larger than in the topsoil • Changes in SOC in subsoil are even slower, more time required to detect significant changes • In some soils it will be very difficult to sample deeper due to rock (fragments) • Lack of validated models for subsoil and data for calibration • Remote sensing based approach can only be used for the topsoil
Preliminary findings	General consensus: Most experts agree on a minimum sampling depth at 30 cm or deeper. However, it should not be obligatory for all projects to go beyond 30 cm depth, to avoid high costs. In case of no/reduced tillage it is recommended to also take the subsoil into account.	

2.6 Feedback Expert Group on carbon removal activities topics

Experts gave feedback on agroforestry, biochar, eligibility criteria for carbon removal activities and carbon pools. The need for clear boundaries and definitions and for upholding environmental integrity came out strongly across all removal activities. Most expressed the importance of having a balance between the applicability of the methodology and the absolute certainty of the impact of the practices, while warning of the narrow focus on carbon. Majority of the experts believe that competent agricultural advisory and guidance for farmers and land managers is critical and should be an essential element to establish a sound scientific base for the methodologies and scheme, and to implement projects locally and at scale.

Experts support agroforestry as an eligible activity, but express concerns for the need to have safeguards in place to ensure further conventional intensification or the selection of fast growing crops for their sequestration potential is not incentivised.

Biochar as an eligible activity raise concerns and calls for further elaboration on certain aspects. Experts are concerned that by limiting the scope of biochar use to SOC, other options for its use are not considered. There is a lack of reasoning and need for further explanations on the finding that it is easier to divide the certificates over producer, supplier and user of the biochar. Likewise, the assumption that this option will be less attractive to farmers needs elaboration, especially on how the farmers are envisioned to be remunerated in this system.

There is an overall agreement to have eligibility criteria for activities. However, there is criticism that section 2.4 assumes that methodologies are based on practices prescribed, and not effects. Experts are not enthusiastic about negative list and express concerns that it may exclude activities with regional or project-specific benefits and that the approach is too binary.

Experts support limiting soil analysis to 30 cm depth, while acknowledging if the purpose is for monitoring, then more detailed sampling may be needed for some practices. Some experts deem subsoil sampling down to 100 cm to be compulsory, not only for ensuring that transfers between top soils and deeper layers are captured, but also as a filter to deter "free riders".

3 Quantification

3.1 Introduction

Carbon removal / soil emission reduction practices need to be quantified accurately and deliver unambiguous benefits for the climate. In this technical assessment paper the following themes about quantification are discussed:

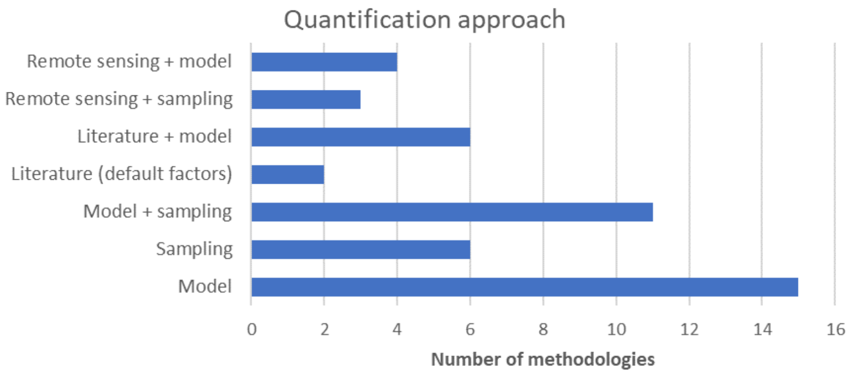
1. Quantification approaches for soil carbon stock changes
2. Quantification of ‘soil emission reduction’ / ‘carbon release’
3. Rules for baselines
4. Quantification of the direct and indirect emissions
5. Quantification of uncertainty

3.2 Quantification approaches for soil carbon stock changes

Definition	Quantification approach for soil carbon stock changes *Related to Annex I (d) rules for calculating the total carbon removals referred to in Article 4 (1), point (b), or in Article 4 (2.1), point (b), or in Article 4(2a) point (b)*
Issue	There are several options to quantify soil carbon stock changes, either based on direct soil sampling, modelling, remote sensing observations or a combination of approaches. The existing methodologies apply different approaches and it is not clear which is the most appropriate approach to use and how prescriptive the approach should be. The provisional political agreement on the Regulation requires that “The monitoring shall be based on an appropriate combination of on-site measurements with remote sensing or modelling according to the rules set out in the appropriate certification methodologies.” Therefore, monitoring could not be based exclusively on remote sensing or modelling, and some form of on-site measurement is required. On-site monitoring of SOC stock changes is challenging due to: - Expected changes are small compared to a large existing SOC stock - There is a high spatial variability in the field - There is also temporal variability - Different soil sampling and analysis methods are used in practice - Often only changes in SOC content are measured and no data on soil bulk density is available For modelling approaches many soil carbon or ecosystem models have been developed, which vary considerably in their applicability and sensitivity. Also the level of validation of these models is for many models insufficient (Garsia et al., 2023) and guidelines for model selection are lacking.

<table>
<tr><td></td><td colspan="2">Besides these more traditional SOC models, also new models based on remote sensing (RS) data are emerging. It is important to define what type of RS is used, e.g. satellites or drones (UAVs) and what it would be used for. There are different options to use remote sensing data: i) use of RS data to estimate SOC content based on spectral data, ii) use of RS data together with other spatial co-variables to establish a model, often using machine learning techniques, which predicts SOC, iii) use of RS data to estimate aboveground biomass (e.g. use of LIDAR) and iv) use RS data to improve input data for SOC models (e.g. soil cover and biomass).

Key questions:
Which approach should be used for the quantification of soil carbon stock changes?*
- Which is the best guidance to build on for direct soil measurements?
- Should there be a pre-approved list of models that can be used or is a general guidance on model application sufficient?</td></tr>
<tr><td>Objective</td><td colspan="2">Reliable quantification of SOC changes while minimizing administrative burden and costs of MRV.</td></tr>
<tr><td>Existing certification approaches</td><td colspan="2">There are many different approaches being used, the review of the existing methodologies showed the following distribution. Most methodologies make use of models, but also some methodologies are based on a sampling-resampling approach. Only few methodologies use only default factors or only remote sensing.



Verra allows two approaches for SOC in their methodology, a Measure and Model approach and a Measure and Remeasure approach. Gold Standard also allows multiple approaches: on site measurements, calculation approaches or default factors following IPCC stock change approach.

There are also existing guidelines for soil sampling, such as from FAO and different certification methodologies.

A combination of soil sampling, modelling and remote sensing has been proposed in the scientific vision for a global framework for MRV of SOC change (Smith et al., 2021). Such approaches are now being further developed in several European projects, such as ORCaSA, MARVIC and MRV4SOC.</td></tr>
<tr><td>Options:</td><td>Pros</td><td>Cons</td></tr>
</table>

Combined/hybrid approach	• Combination of sampling, modelling and remote sensing is suggested as best approach by science (see e.g. Smith et al., 2021). • Soil measurements provide results of actual SOC changes, while the use of modelling and remote sensing allows for upscaling.	• Still a lot of work is in development • Guidelines for model selection are lacking • Risk on too high complexity • Cost-effectiveness still to be proven
Only direct measurement of SOC changes	• Direct field evidence • Considered as more transparent (often view from farmers and NGO's) • New approaches for optimized sampling are available • Sampling protocols exist (e.g. FAO GSOC MRV protocol)	• High uncertainty due to spatial variability, small changes over time, many samples required to reduce uncertainty • Bulk density measurements are often not available, which increases the uncertainty in the calculation of stock changes. • How to deal with the Equivalent Soil Mass discussion (see Wendt and Hauser, 2013; Fowler et al. 2023), as this is not straightforward to implement in existing soil sampling methodologies • Expensive, many samples required • Different laboratory analysis exist (FAO GLOSOLAN initiative[3])
Only modelling of SOC changes*	• Allows prediction of expected changes • Takes account of local conditions (soil type and climate) and farm specific management • Relatively low cost • Verra has guidance for model application	• Many different models exist and no list of approved/validated models is available • Models still require measured SOC data as input for starting point, which increases the cost if this data is not available • Uncertainty can be high, especially in terms of absolute SOC balance, and depends on selected model (e.g. Bruni et al., 2022) • Considered as less transparent (black box) • New modelling approaches take a long time to calibrate and validate for the different crops/practices
Remote sensing based (direct detection of changes in SOC)*	• Can be used at large scale • Relatively low cost • Can also be used for monitoring activity data	• Uncertainty in SOC quantification is still too large for accurate direct detection of changes in SOC, see also outcomes of Focus Group in Credible. • Most suitable for arable land as reflectance from bare soil is required for direct detection

[3] https://www.fao.org/global-soil-partnership/glosolan/en/

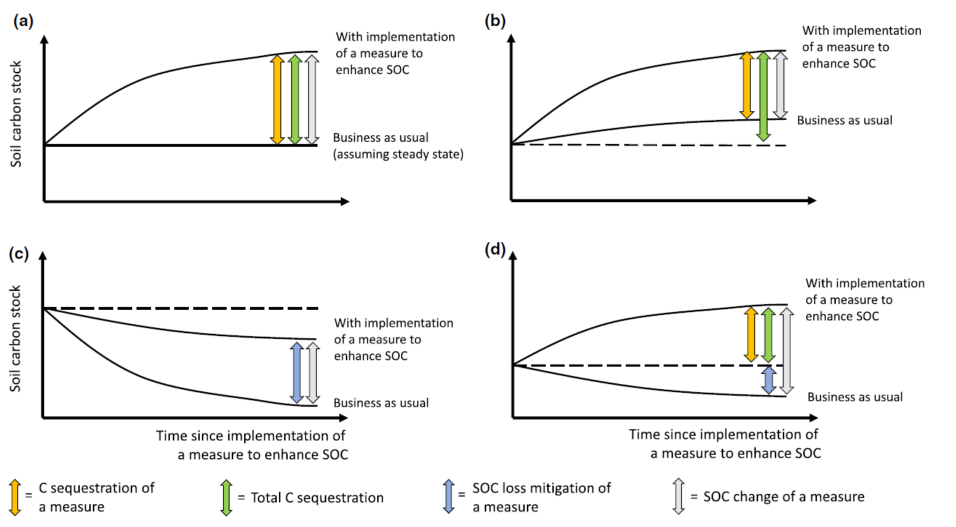
		• Based on very complex (machine learning) algorithms
Default factors*	• Simple approach • Low cost • Predictability for the farmer	• Might deviate strongly from the actual situation • Does not fit with a result based approach • IPCC guidelines are too coarse, while review/meta-analysis articles often not provide widely accepted numbers • Default values require a long activity period compared to a model based approach using actual data
Note	* Options marked with an asterisk were still open for discussion at the time when the focus groups held a discussion on this topic; however, following the provisional political agreement on the Regulation, those options should be discarded in light of the provision which requires on-site monitoring combined with either modelling or remote sensing (or both).	
Preliminary findings	General consensus: Experts agreed that a combined or hybrid approach, wherein several quantification approaches, such as soil sampling, modelling and remote sensing, are used, is preferred. The approaches are complementary, they cannot replace each other. However, it is uncertain what accuracy level is needed and how to do it, as there is still lot of development for this type of approaches. It needs to be clear what role is envisaged for modelling, sampling and RS. If the methodology provides common (MRV) guidelines to reduce complexity, then a hybrid approach is possible. This should build on existing experiences, e.g. the CIRCASA consortium has made recommendations on hybrid MRV, combining RS and modelling in order to complement the results. Rather than putting forward one technique or the other, some experts suggested that we rather make criteria on transparency and accuracy or set up monitoring plots (benchmark sites) for testing approaches and ex-post accuracy assessment. As technological innovation is fast, while legal processes to update methodologies are slow, it is considered important to not limit the methodology to current accepted techniques/models, to allow room for innovation which can bring down sampling costs. To ensure consistency with GHG inventories, a tiered approach may be attractive, where the use of a lower tier would imply discounting part of the certified units, which would incentivise the use of higher tiers to obtain more credit value.	

3.3 Quantification of ‘soil emission reduction’ / ‘carbon removal’

<table>
<tr><td>Definition</td><td>Quantification approach for soil emission reductions

Related to Annex I (da) rules for calculating LULUCF soil emissions referred to in Article 4 (2.2), point (b); and Annex I (db) rules for calculating agricultural soil emissions, referred to in Article 4 (2.2), point (d);</td></tr>
<tr><td>Issue</td><td>In the provisional political agreement, the distinction between LULUCF net GHG removals and soil emission reductions (both from LULUCF soil carbon pools and from the IPCC category of agricultural soils under the Agriculture sector) was made more explicit. Activities that increase carbon sequestration in LULUCF carbon pools and activities that reduce soil emissions shall lead to different certified units in the registry.

For soil carbon stock changes, the distinction between removals and CO_2 emission reduction is not obvious. This is illustrated in the figure below from a paper by Don et al. (2023). The change in SOC stocks between the baseline (business as usual) and with implementation of a carbon farming practice (the grey arrow) is what is normally modelled or measured in case of ‘space for time substitution’ experiments. Whether this is a removal (yellow arrow) or a soil emission reduction (blue arrow) depends on the SOC balance (difference between carbon inputs to the soil and the decomposition of carbon in the soil, which determines whether a soil is losing or gaining carbon) of the baseline, which is determined by the current SOC stock and current soil management.



The following issues can emerge:
Farmers applying the same practices might get different certificates, as their starting condition determines whether it will be carbon removal (figure b) or emission reduction (figure c)
For making the split between carbon removals and emission reductions, the absolute SOC balance should be determined for both the baseline and project scenario (blue and green arrow in figure d). Model-based approaches will have a higher uncertainty, as a model is better in predicting a change between two scenarios (i.e. situation with practice compared to baseline) than predicting the absolute SOC balance.</td></tr>
</table>

	• An explicit split will create more complexity, while there is no difference in the impact the practices will have on the CO_2 concentration in the atmosphere for 1 ton CO_2 emission reduction or carbon removal from soils. • Requires control sites for soil sampling based approaches to detect soil emission reductions, which will increase sampling cost and it will not be possible to have control sites for all combinations of practices and pedo-climatic conditions. **Key question:** How should the methodology for agricultural land deal with the distinction between carbon removals and soil emission reduction?	
Objective	The Council and European Parliament have made proposals to explicitly split carbon removals and emission reductions in the methodologies. This has been included in the provisional agreement on the CRCF. For certification of carbon farming practices that affect SOC in mineral soils, a workable approach is required to manage this explicit split.	
Existing certification approaches	In the existing methodologies, no explicit split is made between carbon removals and emissions reductions. In model-based approaches, the carbon stock change between the baseline and the activity scenario is used for certification without making a distinction between removals and emission reduction. Some methodologies assume a standardised baseline of zero emissions, in that case all increase in SOC stocks would be considered as carbon removals that are eligible for certification. Some other methodologies, e.g. Boomitra and the quantification approach 2 (Measure and Re-Measure) of Verra, work with control sites where soil samples are taken as well and where the control sites are considered as the baseline. In that case it would be possible to distinguish between soil emission reduction and carbon removals, because the control sites will show whether the soil was a net source or sink.	
Options:	Pros	Cons
Increase in SOC balance compared to the baseline is considered as carbon removals	• In line with most current methodologies • More simple approach, as no distinction has to be made between a carbon removal certificate and emission reduction certificate, and the impact on the CO_2 concentration in the atmosphere is the same. • Easier for liability mechanism, as a buffer pool is normally not used for emission reduction.	• A quantification approach based on SOC measurement only would require control sites to account for soil carbon emission reduction, as otherwise you would not know what the emission would have been in the baseline.
Only an increase in SOC stock is certified as carbon removal	• More certainty that only carbon removals are certified • Would simplify the baseline setting, as the baseline would be a SOC balance of zero	• The scope for certification is limited, as on many arable soils, the current SOC balance shows emissions, and reduction of these emissions would not classify for certification •
Preliminary findings	This topic was not discussed at the Technical Focus Group meetings due to lack of time as it was not prioritised, since the relevance was still depending on the political discussions on the CRCF proposal. In the provisional agreement the distinction between carbon removals and soil emission reductions is now explicitly included, but for the development	

	of the methodology for agricultural land, this is still a topic that has to be addressed, as it has implications for the quantification approach.

3.4 Quantification of the direct and indirect emissions

Definition	Quantification of the direct and indirect GHG emissions *Related to Annex I (e) rules for calculating $GHG_{associated}$ emissions referred to in Article 4(1), point (c), in Article 4 (2.1), point (c), in Article 4(2.2), point (g), and in Article 4(2a), point (c)*
Issue	Implementation of new carbon farming practices that aim to increase carbon removals or reduce soil carbon emissions might involve an increase of direct GHG emissions, e.g. from increased fuel use or mineral fertilizer use or indirect GHG emissions, such as emissions related to fertilizer and pesticide production or from land use change due to displacement of agricultural production. As these emissions reduce the mitigation effectiveness of the carbon farming practice, the increase of emissions must be subtracted from the quantified carbon removals / emission reduction. The direct emission sources that are involved depend on the type of carbon farming practice, but in general quantification is rather straightforward based on IPCC guidance or making use of emission factors from national GHG inventories. For indirect emissions, quantification is more complex as these can often not be quantified directly and default numbers might have to be used, as is the case in the GHG calculations for the Renewable Energy Directive. An alternative can be to exclude certain carbon farming practices that might have a high risk on ILUC. In the frame of the EC RED and ICAO work, direct land use change (DLUC) is a change from food/feed to energy crops, and ILUC the associated indirect change due to the replacement elsewhere of the food/feed production. If there is a change of crop in order to store carbon there could be a significant ILUC or DLUC impact. **Key question:** How to deal with indirect emission from indirect land use change (ILUC)?
Objective	To ensure reliable carbon removals also the direct and indirect emissions related to the carbon farming activities have to be quantified as well in a relevant, accurate, complete, consistent and comparable manner.
Existing certification approaches	Most existing methodologies quantify the increase in direct emissions due to implementation of the new carbon farming practice. Also indirect emissions related to a change in practice, e.g. fertilizer production emissions, are taken into account in some of the methodologies. Direct quantification of indirect emissions due to indirect land use change, also referred to as leakage, e.g. due to lower crop productivity or shift in land use, is not included in most methodologies. The CAR Soil Enrichment Protocol and the updated Verra VM0042 v2.0 methodologies have approaches to quantify the effect of leakage due to

	changes in agricultural productivity. Also ORMEX and Gold Standard seem to have some provisions for leakage. In the Renewable Energy Directive (RED) there is the possibility to certify for low-ILUC risk biofuels, bioliquids and biomass fuels, as indicated in Delegated Regulation (EU) 2019/807. However, a direct translation of this approach to carbon farming is not straightforward.	
Options:	Pros	Cons
Excluding carbon farming practices with high risk on ILUC	• Simpler approach • Somewhat in line with the RED, which list to what extent biofuel crops are counting towards the national targets. There is the option to define low-ILUC crops.	• Difficult to judge beforehand which practices have a high risk on ILUC • Some practices might lead to (temporary) lower agricultural productivity, but in a scenario with diet change, there is less demand for feed production and then there would be no leakage effect
Quantification of indirect emissions related to ILUC	• Should give a more realistic estimate of the real carbon removal / emission reduction • Some guidance is available from existing methodologies	• Very difficult to quantify these impacts, as shown in earlier work for the RED • Many assumptions required and probably not very transparent
Preliminary findings	This topic was not extensively discussed due to lack of time. However, the overall opinion was that although some indirect emissions are quantified easily, such as increase of fertiliser at field level but also upstream (more fertiliser produced so less emissions associated to production of fertilisers), others, including emissions from ILUC, are complex but may not have tremendous effects. For those an extensive data collection should be avoided.	

3.5 Rules for baseline

3.5.1 Introduction

The first step in the Quantification process is that operators should quantify the amount of additional carbon removals/soil emission reduction that a carbon removal activity has generated in comparison to a baseline. A standardised baseline, reflecting the standard performance of comparable practices and processes in similar social, economic, environmental, technological and regulatory circumstances and take into accountant the geographical context, including local pedoclimatic and regulatory conditions, is the default baseline according to the provisional agreement on the CRCF regulation. This should ensure objectivity, minimise compliance and other administrative costs. An activity-specific baseline is only allowed by way of derogation, where duly justified in the applicable certification methodology, including due to the lack of data or the absence of sufficient comparable activities, an operator shall use a baseline that corresponds to the individual, performance of a specific activity (section 3.4.3).
In the context of carbon farming, the use of available digital technologies, including electronic databases and geographic information systems, remote sensing, artificial intelligence, and machine learning, and of electronic maps should be promoted to decrease the costs of establishing baselines and of monitoring carbon removal activities. To reflect the social, economic, environmental, and technological developments and to encourage ambition over time in line with the Paris Agreement, baselines should be periodically updated.

3.5.2 Standardised baseline

This section has been developed by JRC, who will assist the Commission in the development of the standardised baselines.

Definition	Rules for calculating the carbon removals under the baseline referred to in Article 4(1). Net carbon removal benefit = $CR_{baseline} – CR_{total} – GHG_{increase} > 0$ **$CR_{baseline}$ is the carbon removals under the baseline;** (5) The baseline shall correspond to the standard carbon removal performance of comparable activities in similar social, economic, environmental and technological circumstances and take into account the geographical context. (6) By way of derogation from paragraph 5, where duly justified, the baseline may be based on the individual carbon removal performance of that activity.
Issue	The estimation of land C fluxes (emissions/removals) is a highly challenging process that may lead to different results depending on data and methodologies applied (McGrath et al., 2023). So far, there is not a consolidated method, but an ensemble approach (e.g. the use of multiple diverse model to predict an outcome) may provide the best estimate overcoming each methodology limitation. One of the main problems is that complex scientific tools and large amount of data are used in the scientific community to derive territorial land fluxes, which can be difficult to operationalize in a simple equation. **Key questions** **Similar social, economic, environmental and technological circumstances** o Which data and variables can be used to describe the 'social' and 'economic' dimensions (e.g. farmer income, farm size, wood prices, etc.)? Otherwise, should the ‘social’, and ‘economic’ dimensions be defined in a simpler way, for instance considering administrative regions (e.g. NUTS 1-2-3) as strata? In case administrative units are chosen, which NUTS level is more appropriate? o What fundamental ‘environmental’ dimensions strata are envisaged to develop a standardised baseline (e.g. specific soils properties, climate, vegetation properties – crop type, tree species, stand age, etc.)? o Should pan EU dataset (e/g LUCAS, Copernicus data, ESA CCI biomass maps etc.) be preferred as environmental strata to guarantee a high level of standardisation or national (sub-regional data) be prioritized? Could you indicate data layers that you consider good datasets for your specific sector of interest?

	Carbon removal performance / Greenhouse gas increase ○ The carbon removal performance is expressed as GHG fluxes. What impact does this have on early movers that have already achieved high C stocks and have consequently low removal rates? Is it recommendable and/or fundamental to reward them? ○ What data are needed to establish the baseline for calculating the GHG (i.e. not only CO_2 but also N_2O and CH_4) due to the implementation of the carbon farming activity? Would a standardised baseline be possible for these fluxes? Could they be approximated by lower tier IPCC-based calculations? **What does "standardised" mean?** ○ In your view, should the standardised baseline be dynamic (i.e. represent a trend over the period in question) or static? ○ How long should the reference period needed to calculate the standardised baseline be? Should it differ by sector such as agriculture/forestry/peatland), and if so how? ○ Could data from the National Greenhouse Gas Inventories be used? If based on higher tiers and spatial explicit approaches, would these able to provide regional emissions/removals? ○ An activity- specific approach can be used in the absence of data to develop robust standardised baselines. Based on your knowledge on the currently available data and methodological approaches, in which sectors (forest, peatland and agriculture) could the standardised baseline be applicable from the start?	
Objective	Set a robust methodology to calculate net ecosystem carbon emission/removals (from soil and vegetation) that reflects the current status of homogenous areas for type of land cover/use and pedo-climatic conditions.	
Existing certification approaches	The baseline is often defined as fixed (measuring the removal/emissions rates at the start the project) or dynamic (updating the values over time). Different methodologies ranging from sampling to modelling and hybrid approaches are used depending on the certification scheme, including project specific and (to a lesser extent) standardised (Oldfield et al., 2021; McDonald et al., 2021; Batjes et al., 2023). For temperate and boreal forest guidelines are also available[4]. Some mechanisms allow for a standardised baseline calculated over a geographic region, which can be set at the national of jurisdictional level. It is more used in the forestry sector (e.g. NZ Permanent Forest Sink Initiative, Woodland Carbon Code, California's Compliance Offset Programme)	
Options:	Pros	Cons
Use of Pan-EU elaborated dataset (e.g. soil maps , Copernicus data, land	• Provide a standard • Freely available for MS • Less systematic biased among MS	• Possibly less accurate than national local datasets • Time dependence of the product

[4] https://verra.org/wp-content/uploads/imported/methodologies/VM0012-Improved-Forest-Management-Projects-in-Temperate-and-Boreal-Forests-LtPF-v1.2.pdf

cover, ESA CCI biomass maps etc.)	• Strata for clustering	• Underlying raw data not easily available or manageable for further elaboration
Use of soil inventories: (At National or local scale, e.g. National inventory data, but also LUCAS soil sampling point data)	• Direct measure of a state variable • Better local knowledge • Data already available or probably required for Soil monitoring law (if adopted) • New data collected by the operators in the course of the certification period	• Mainly limited to SOC content • Lag between sampling and data usability (less useful for dynamic baselines) • Sampling density and representativeness • Elevated cost • Variability and standardisation
Remote sensing based datasets of state variables (e.g. aboveground stocks) and management activities	• Good spatial representation and distribution • Timely estimate (including effects of recent climate change effect on vegetation states. Ideal for dynamic baselines) • Cost-effectiveness	• Mostly limited to aboveground biomass and few key parameters • Rely on the use of modelling to calculate the net C removals from the monitored state variables (e.g. allometric equations) • Representative only of the last years (limiting for baselines calculated over long past periods) • The products require ground datasets for validation
Process-based modelling	• Cost-effective • Easily updatable • All C fluxes and stocks • 'Projected' and 'dynamic' baseline development	• Requiring high skills • Calibration and validation • Computational time for regional simulations • Data demanding • High uncertainty even when calibrated
Preliminary findings	General consensus: Farm sizes in carbon farming projects or countries should determine the scale for the standard baseline. Many participants were in doubt whether the NUTS scale is the right scale to identify a standard baseline. Not all participants agreed that a standardized baseline should be the default. Much of the national data is not yet in order, such as the drainage and hydrological conditions of peat. Preparation time must be taken into account to get the data in accurate shape to develop a standard baseline. Until then an activity specific baseline should be used. There could also be a potential issue on model use, if the baseline is determined with other models than the simulation with carbon farming practices. The group is in favour of using a hybrid approach (national, regional and local (project specific) data) to be incorporated in the standardised baseline. A statistical method is proposed, where it can be defined how well an EU-dataset represents a local situation. Based on the outcome it can be decided to incorporate more localised data. The group discussed the opportunity of the certification framework to apply the same approach used in the GHG National Inventories (2006 IPCC guidelines and	

	2019 Refinement) for defining the standardised baseline consistently with inventories

3.5.3 Activity specific baseline

Definition	Rules for calculating the carbon removals or soil emission reductions under the baseline referred to in Article 4(2): Net carbon removal benefit = $CR_{baseline} – CR_{total} – GHG_{associated} > 0$ Net soil emission reduction benefit = $LSE_{baseline} – LSE_{total} + ASE_{baseline} – ASE_{total} – GHG_{associated} > 0$ $CR_{baseline}$ is the carbon removals under the baseline; $LSE_{baseline}$ are the LULUCF soil emissions under the baseline; $ASE_{baseline}$ are the agricultural soil emissions under the baseline; Article 4(6): By way of derogation from paragraph 5, where duly justified, the baseline may be based on the individual carbon removal performance of that activity. *Related to Annex I (c) rules for calculating the baseline referred to in Article 4(1), point (a), or in Article 4 (2.1), point (a) and (2.2), points (a) and (c), or in Article 4(2a) point (a)*
Issue	The quantification of SOC removals/soil emission reduction should be based on a robust approach and provide reliable outcomes. As currently no standardised baseline is available, certification shall be based on an activity specific baseline in the first years after the start of the CRCF. Clear rules for such an activity-specific baseline have to be defined. According to the provisional agreement on the CRCF Regulation the activity-specific baseline should be updated at the beginning of each activity period and stay the same until the end of the activity period. The pre-project period on which the baseline will be established is one of the aspects that has to be defined in the methodology. In order to ensure a certain level of consistency in the approach between activity specific and standardised baselines, the methodology might prescribe a set of standard methods/tools to assess/calculate the net carbon removal /soil emission reduction benefit. This aspect was not discussed during the focus group meeting, but is relevant for the further development of the methodology and should be aligned with the development of the standardised baseline. **Key question:** How long should the pre-project reference period for setting the activity specific baseline be?
Objective	Set a robust methodology to calculate net carbon removals/soil emission reduction (from soil and vegetation) that reflects the current status of removals/soil emissions to which the effect of the carbon farming activity will be compared.
Existing certification approaches	According to the review of existing methodologies, most methodologies make use of a project specific / activity based baseline, i.e. the operator's performance at the beginning of the certified activity. Of the 27 assessed methodologies, 17 used an activity specific baseline, 8 had a hybrid approach, 1

	methodology used a standardised baseline and one methodology makes use of a dynamic baseline using control sites. Only the 'Avoided conversion of grasslands and shrublands to crop production 2.0' by **American Carbon Registry (ACR)** methodology has a standardised baseline. In case the option for both the activity based baseline and standardised baseline is provided (hybrid), the activity based is often preferred (e.g. Label Bas Carbone). **Verra** allows the use of a performance benchmark (regional average) if one is approved by Verra, but currently there are none approved due to lack of data. **Soil Capital Carbon** has an interesting hybrid approach. Each participating farm receives an individual, net GHG emission reduction and removal assessment of their historical practices. Any farm whose historical practices result in net emissions will use their own individual GHG inventory as their baseline. Any farm whose historical practices result in net removals will use an Adapted Regional Default Value (ARDV) as their baseline, which can be considered as a standardised baseline. The ARDV is calculated for each region to reflect regionally specific parameters (such as type of crops and soil characteristics). For the activity based baselines, often a period of 3-5 years is used to represent the pre-project management (historical activity data). Some methodologies also make use of dynamic baselines, e.g. **Boomitra** has baseline control sites to which farms are matched on the basis of similarity in terms of biogeographical conditions and farm management. Some methodologies provide information about how a standardised baseline could be constructed, e.g. C Farms and Soil Capital, but often the data is still lacking. E.g. C farms for now assumes carbon removal under the baseline to be zero on the assumption that conventional practices are sources of emissions, which means that all increase in soil carbon is considered as additional.	
Options	Pros	Cons
Short reference period (e.g. 3-5years)	• Lower data requirement • Reflects better current management • Changes in legislation are reflected faster • In line with most existing methodologies	• If too short, it might not cover the full crop rotation • In case of modelling, the baseline might be affected by spin-up effects (i.e. some models need a few years of simulation to get stable results)
Long reference period (e.g. more than 5 years)	• Provides a more stable baseline • Less affected by years with extreme weather • In case of modelling a more stable baseline might be made (less potential spin-up effects)	• High data requirement • Historical data might not be easily available • Practices might have changed during the reference period • Recent policy changes are not accounted for
Preliminary findings	General consensus: The group agreed to 3 to 5 years for the reference period, wherein the exact length should be depending on the crop rotation and the measuring technology. The historical period should cover the start and end of the crop rotation period. The crop rotation reference may be captured in time, but also space (fields), which would reduce the need for a longer period.	

	For setting the baseline it is important to measure in a comparable manner, for instance using RS for both the baseline and situation with carbon farming practices. For practices involving a change in crop type or land use, there should be clear guidance how to deal with direct and indirect land use change effects, which are not directly captured in the baseline.

3.6 Quantification of statistical uncertainty

Definition	Quantification of statistical uncertainty *Related to Annex I (f) rules to address uncertainties in a conservative manner in the quantification of carbon removals referred to in Article 4(8)*
Issue	The quantification of SOC removals/emission reduction should be based on a robust approach and provide reliable outcomes. Ideally the quantification should therefore be accompanied by an uncertainty estimate to provide confidence in the measured or calculated carbon removals/soil emission reductions. Quantification of uncertainty depends on the quantification approach. With soil measurements, the uncertainty is based on the soil samples and laboratory analysis, while with model-based approaches, uncertainty of the input data, model parameters and model structure are relevant. **Key question:** Should statistical uncertainty be quantified or should the methodology only have a mechanism to deal with uncertainty, e.g. discounting? If yes, at what level should the uncertainty be quantified, for the group of operators or for an individual farm?
Objective	The provisional agreement on the CRCF regulation requires that the quantification temporary carbon removals from carbon farming and soil emission reductions shall account for uncertainties in a conservative manner and in accordance with recognised statistical approaches and these uncertainties shall be duly reported.
Existing certification approaches	The review of existing methodologies showed that most of them do not explicitly quantify uncertainty. Instead, some fixed deductions are applied (e.g. Label bas Carbone has a discount of 10%) or make use of default uncertainty values from the IPCC guidelines. However, several methodologies do quantify uncertainty, e.g. the **CAR Soil Enrichment Protocol**. Uncertainty is computed from the 30th percentile based on the sampling distribution (measurement based approach) or the model variance, which a 70% probability that the actual emissions reduction exceeds the amount claimed in the credits. The recently updated **Verra VM0042** 2.0 methodology does include a very detailed approach for quantifying uncertainty (22 pages). The uncertainty calculations consider measurement errors and model prediction errors. VM0042 provides means to estimate a 90 percent confidence interval. Compliant with the VCS Methodology Requirements, if the width of the

	confidence interval exceeds 20 percent of the estimated value, then an appropriate confidence deduction is applied. This uncertainty deduction is based on a defined threshold in the estimated probability density function, this is based on a 66.6% probability of exceeding the true value.	
Options:	Pros	Cons
Explicit quantification of statistical uncertainty	• Provides more insight in the certainty of the quantified carbon removals • Uncertainty quantification is also required for reporting in line with the GHG protocol	• Difficult to calculate as required data (e.g. probably distributions) are often not available • Additional administrative burden • Requires highly skilled intermediaries • Uncertainties in soil carbon sequestration are high and might lead to large deductions, especially if applied at small scale (farm level or small projects) • Smaller scale projects would have automatically a higher uncertainty
Generic approach for dealing with statistical uncertainty without explicit quantification (e.g., program-wide risk sharing)	• Much simpler approach and therefore lower costs • More transparent • Would make more sense when using a standardised baseline approach	• Higher risk of under- or overestimating carbon removals • Maybe not sufficient to comply with GHG protocol criteria
Preliminary findings	General consensus: Most experts are in favour of quantifying the uncertainty and expressing it at project-level, as the uncertainty at farm level would be too high. Availability of data for uncertainty quantification is different amongst regions in Europe. Tiered approach might be needed, depending on data availability. A probability of exceedance approach is better when dealing with small effect sizes, as is the case for SOC stock changes; in such case, a confidence interval approach doesn't work well. The Australian national system, VCS VM0042, and CAR Soil Enrichment Protocol now all use the probability approach. Communication of uncertainty is much more straightforward in this approach. The policy decision then is where to set the threshold (AUS = 60%, VCS = 66.7%, CAR = 70%). An option might be to use a default uncertainty with higher discount, where projects have the option to quantify the uncertainty and use a lower discount if the uncertainty is proven lower, similar to the GHG calculation for the RED.	

3.7 Feedback Expert Group on Quantification topics

Experts showed significant support for a combined or hybrid approach to quantifying soil carbon stock changes, emphasising its potential for accuracy, reliability, and cost-effectiveness, though noting the need for careful design and validation. Direct measurements were favoured for their accuracy but mentioned as a con for high costs and practicality issues, while sole reliance on modelling was widely opposed due to its limitations. Remote sensing, though beneficial in hybrid approaches, was deemed insufficient on its own.

For quantifying soil emission reductions and carbon removals, an approach based on the increase in SOC balance compared to a baseline was generally favoured, but concerns were raised about accurate measurement, monitoring, and the complexity of distinguishing between emission reductions and sequestration. The use of pan-EU datasets for standardised baselines was supported for consistency but faced scepticism over the risk of "phantom credits." National or local soil inventories were praised for accuracy and cost-effectiveness, but challenges included high variability and data ownership issues. There was broad support for incorporating dynamic baselines with continuous updates. Experts called for balancing methodological advancements with maintaining environmental integrity and fairness in carbon accounting. Process-based modelling was recognised for potentially improving accuracy and reducing costs, but concerns about variability, standardisation, and the risk of greenwashing were mentioned as high. Lastly, the explicit quantification of statistical uncertainty was deemed necessary to ensure accuracy and avoid over- or underestimating carbon removals.

4 Additionality

4.1 Introduction

The rationale of the provisional agreement on the CRCF regulation is that operators will adopt new and additional, improved cultivation practices to achieve verifiable emission reductions or removal of greenhouse gases. The certification therefore applies to additional efforts by the operator and is not intended for activities that would have taken place in a business-as-usual scenario, for example because a certain activity is already happening, financed by a third party or required by law or national policy.

To ensure that the Union certification framework channels incentives toward carbon removals that go beyond the standard practice, carbon removal activities should be additional and must represent a real and additional reduction or removal of emissions compared to what would have happened in the baseline scenario.

Additionality rules must also consider whether the operator is already rewarded for the same activity through other financial arrangements from the EU or national governments or whether additional rewarding via carbon certificates is needed to make the activity financially viable. In other words, carbon removal activities should take place due to the incentive effect provided by the certification, that make it possible to cover the cost of implementation.

An important consideration in the carbon methodologies' debate, in particular in talks around Art 6.4 of the Paris Agreement, is the promise by countries that climate ambition should progress over time, to stay in line with 1.5 degrees. That means that additionality should be compared to a dynamic baseline, upgrade the baseline regularly, or allow future discounting. If for example a strengthening of policies is foreseen, this should be taken into consideration (e.g. no till farming for example, or phasing out fertilizer use, leading already to more green fertilizer and clover on agricultural soils).

In case of an activity that performs better than the standardised baseline, the additionality criteria are considered to be complied with. Therefore, the additionality criteria regarding regulatory and financial additionality are only relevant in case an activity-specific baseline is used.

4.2 Additionality rules in case of an activity-specific baseline

Definition	Article 5: Any activity shall be additional. To that end, it shall meet both of the following criteria: (a) it goes beyond Union and national statutory requirements at the level of an individual operator; (b) the incentive effect of the certification is needed for the activity to become financially viable. Where the standardised baseline established pursuant to Article 4(5) or (5a) is used, additionality as referred to in paragraph 1 is considered to be complied with. Where the activity-specific baseline is used, additionality as referred to in paragraph 1, points (a) and (b), shall be demonstrated through specific additionality tests in accordance with the

	applicable certification methodologies set out in the delegated acts adopted pursuant to Article 8. *Related to Annex I: (g) rules to carry out the specific additionality tests referred to in Article 5(2)*
Issue	In order to assess the additionality of an activity, it is necessary to set rules on how to test this. This can comprise several aspects of additionality: • Regulatory additionality (i.e., carbon farming practice should go beyond current obligatory practices) • Financial additionality (i.e., carbon farming practice should be implemented as results of the financial incentive from the carbon certificates) Rules regarding regulatory additionality are more straight forward compared to financial additionality, as the activity should go beyond what is the minimum requires by European, national and regional legislation or policy. Still there can be a need to discuss rules regarding relevant policy like agreements between farmer organisations and the government or provinces that oblige to activities for other reasons. The provisional agreement on the CRCF regulation states that the incentive effect of the certification is needed for the carbon farming activity to become financially viable. The methodology should further clarify which rules are required. For financial additionality there are different approaches available and currently no clear EU rules are existing on this topic. **Key questions:** • Which aspects would be relevant to consider when assessing co-funding with public support, e.g. Eco-schemes from CAP, national subsidies, etc? • Which approach should be used for demonstrating financial additionality? • Would it be relevant to demonstrate that a project activity is not common practice (e.g. not more than 20% in a region), similar to other crediting schemes? Would a threshold of 20% be appropriate?
Objective	Development of a verifiable criteria-based approach to determine additionality when an activity-specific baseline is used for certification.
Existing certification approaches	The results of the survey of existing methodologies showed that most methodologies consider both regulatory and financial additionality. Regulatory additionality often requires demonstrating that the practices are going beyond the legal obligations, coming from EU, national or regional legislation. In some methodologies specific tools are available for such an assessment, e.g. **Verra** (VM0042), which contains three steps: the i) regulatory surplus, ii) barrier analysis and iii) the Common Practice Test, which assesses whether a certain practice is already common in that particular region (based on the CDM Methodological Tool).

	For financial additionality there is more diversity in approaches, some methodologies have a reasoning that their suggested practices are additional as they are currently not taken up by the farmer, whereas others clearly have to demonstrate that the practices are having a higher cost that cannot be paid from other public sources, e.g. subsidies. Methodologies aimed at system change, e.g. conversion to regenerative agriculture, often consider their practices as additional, as currently few farmers are using these practices. Some methodologies require the involvement of an agronomist who should help with the implementation of the practices and demonstrate the additionality. From **RED Esca** factor, the methodology comprises a financial attractiveness test and a non-financial barrier test, these are explained in Annex VIII.	
Options:	Pros	Cons
Add a financial attractiveness test to existing legal tests to assess additionality	• The perception that a financial arrangement (subsidy, certification) is not financially interesting often becomes apparent after ending the arrangement. With this option you can tailor the financial arrangement in order to increase the attractiveness for the operator	• A large group of operators might be left out, with also a GHG reduction potential, who face greater uncertainties and who want to try something unusual/innovative to achieve emission reductions.
Common practice test	• Probably results in more effective use of money for carbon farming practices • More innovative practices are stimulated	• Data to demonstrate this might be not easily available • Although a certain practice might be considered a common practice, there might be barriers to other farmers that cannot implement it and carbon certificates might overcome that (financial) barrier
Preliminary findings	*These topics were not extensively discussed due to lack of time.* *Discussion on co-funding* General consensus: The group agreed that public co-funding is desirable, as the financial risk may be shared between farmer and public bodies. According to some participants the certification approach should fit for multiple purposes, such as insetting and certificates. The price from only carbon certificates may be too low and hybrid financing as described in NIVA policy brief[5] could help. The risk is shared when paid with both private and public money.	

[5] https://www.niva4cap.eu/wp-content/uploads/2022/12/NIVA-Policy-Brief-nr.-5-Agro-environmental-indicator-carbon-D1.0.pdf

	Discussion on financial additionality General consensus: Overall, the group has low trust in the financial tests. Financial additionality is relevant, but for a farmer there are more drivers, such as social factors, risk aversion and knowledge. Farmers need to be treated fairly with local references to ensure improvements. Application of financial additionality tests per farm is too complex. However, if aggregated to a larger scale, the general reference may induce low improvements and disadvantage farmers, making the process unfair.

4.3 Feedback Expert Group on additionality topics

There is no significant support for any one of the financial, regulatory or criteria-based additionality rules. Experts express a high level of concern regarding financial additionality, especially heavy or sole reliant on price and market, deemed insufficient to overcome the barriers of an agricultural transition. Projects that bring relevant additionality in non-monetary dimensions should be accepted. Additionality criteria that go beyond and are alternative to financial additionality should be included. If financial barriers are not the main problem, policy should instead focus on capacity building through advisory services and peer-to-peer learning. Alternatively, should a financial additionality measure be adopted, then there should be consideration for instituting an appeal process whereby a farmer could petition to determine whether an exception for financial additionality is allowed.

Most experts favour co-funding or a combination of sources of funding. However, it is important to ensure financial additionality and having maximum public funding thresholds or financial additionality tests in case of public co-funding. There is a concern about double funding that requires further explanations.

Additionality rules in case of activity-specific baselines assume a common practice test. Experts seek more clarity on how exactly the test will work. There are concerns as to how additionality of projects financed through CAP eco-schemes will be estimated in case of public co-funding and how a standardised baseline would account for this. If the financial tests are aggregated to a larger scale, the general reference may induce low improvements and disadvantage farmers, making the process unfair and even rendering activity-specific baseline impossible.

5 Storage, monitoring and liability

5.1 Introduction

Article 6 of the provisional agreement on the regulation states that an operator or group of operators shall demonstrate that an activity stores the carbon permanently or aims to store the carbon over the long-term. For the storage, monitoring and liability criteria four aspects have to be defined in the methodology: i) the activity period, ii) the monitoring period, iii) the monitoring requirements and iv) the rules for liability mechanisms. The discussion at the focus group meeting was focussed on the activity and monitoring periods and the liability mechanisms.

In the provisional agreement on the regulation a distinction is made among carbon removal activities in terms of permanence. Carbon farming practices are seen as capture and temporary storage of atmospheric and biogenic carbon into biogenic carbon pools or the reduction of soil emissions. This is a recognition that many biogenic carbon removals cannot be considered permanent, as risk on reversal is higher and there will be saturation of the storage. However, temporary carbon removal still contributes to lowering peak warming, as shown by Matthews et al. (2022).

The provisionally agreed text of the Regulation introduced an explicit differentiation between the activity period and the monitoring period. The 'activity period' is defined as the period over which the activity generates a net benefit, and whose length is determined in the applicable certification methodology.

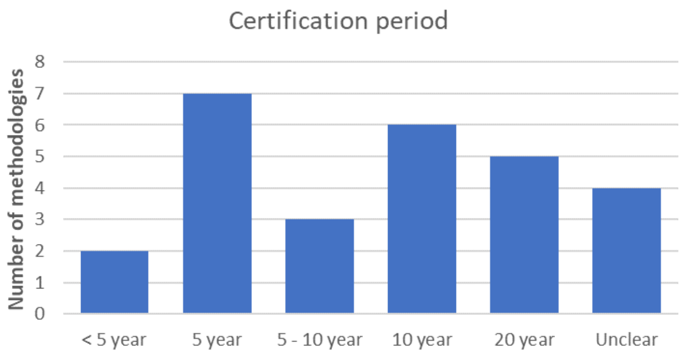
The monitoring period is the period over which the storage of carbon is monitored by the operator. During the activity, units are created which have a certain period of validity (temporary carbon removal units). The monitoring should ensure that the carbon remains stored during and after the activity. For example, an agricultural land management activity happens from 2025 to 2035 and the monitoring period lasts 20 years (i.e., 10 years beyond the activity period); the carbon removal units are therefore valid until 2045. Hence monitoring has to continue at least until 2045 to ensure that the carbon sequestered by the activity in 2025-2035 is still stored. But no new units will be created between 2035 and 2045.

5.2 Minimum duration of the activity period

Definition	The 'activity period' is defined as a period over which the activity generates a net carbon removal benefit or a net soil emission reduction benefit, and which is determined in the applicable certification methodology. For carbon farming activities, the activity period should last at least 5 years. *Related to Annex I (a) type of activity and description of the practices and processes covered, including its activity period and monitoring period*
Issue	As changes in soil carbon stock are small and slow, a longer activity period would lower the uncertainty in the quantification and would contribute to the long-term storage criteria. Especially for agricultural carbon farming practices the risk of reversal of the carbon removals is high if the carbon farming practices are not continued.

<table>
<tr><td></td><td colspan="2">However, farmers might be reluctant to sign up for certification programmes with very long activity periods, as it might limit their flexibility to manage their farm/land and for older farmers, they might not want to take these long-term decisions if their succession is not clear. A longer activity period will also limit farmers to adapt their farm management to future changes in market conditions and agricultural and environmental policies.

Key question:
What should be the minimum activity period?</td></tr>
<tr><td>Objective</td><td colspan="2">A minimum duration of the activity period that ensures contribution to long term storage of carbon in soils and/or biomass, but which is also acceptable to farmers to engage in carbon farming certification programmes.</td></tr>
<tr><td>Existing certification approaches</td><td colspan="2">In the survey on existing methodologies, a question on the duration of the certification period was included, which can be considered similar to the activity period. According to the review, there is quite a variability in the duration of the certification period, see graph below. Nine methodologies have a certification period of 5 years or less, 9 a duration of 7 to 10 years and 5 a duration of 20 years. Several methodologies have the possibility to renew the certification period up to a certain maximum, ranging from 15 year (3 x 5 year) to 100 year (5 x 20 year). The VERRA methodology has a 20 year certification period and Gold Standard and Label Bas Carbon a 5 year period.


</td></tr>
<tr><td>Options</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Short term duration (e.g. 5-10 years)</td><td>• The certification process is more in line with normal planning time frame on farms (e.g. 1-2 crop rotations)
• Provides more flexibility to a farmer to adapt crop and soil management to changing market and policy conditions</td><td>• Unexpected lower removals are more difficult to mitigate over a short period of time
• Higher risk on discontinuation of carbon farming practices and therefore contributing less to long term storage
• The carbon farming practice will no longer be considered additional after renewal of the certification period, as the baseline might have changed</td></tr>
<tr><td>Long-term duration (e.g. 15-20 years)</td><td>• Longer-term commitment and more certainty for long-term storage</td><td>• Farmer might be reluctant to participate</td></tr>
</table>

	• Higher certainty on the measured changes in SOC stocks • More in line with IPCC guidelines (e.g. 20 year equilibrium period)	• Less flexibility to adapt practices to changing market conditions and policies • Risk on overcompensating the activity as the baseline will remain the same while in reality circumstances might have changed
Preliminary findings	General consensus: The majority of experts preferred a shorter period (e.g. 5 years). The activity period should be well-adapted to the type of carbon sequestration. It is important to take into account the pragmatic viewpoint of farmers. To ensure permanence, incentives need to be kept in place longer. Monitoring should be linked to the crediting and should be renewable, it should be incentivised to renew the activity. Renewal of the baseline could lower the amount credited, but this could still incentivise to keep carbon stored for longer. Carbon farming practices in arable agriculture could have a shorter activity period compared to grassland and perennial cropping systems. In the case of biochar, it does not make sense to define an activity period as the effect are usually there after a single application to the soil.	

5.3 Minimum duration of the monitoring period

Definition	The monitoring period is defined as a period over which the soil emission reduction or storage of carbon is monitored by an operator or a group of operators and which covers at least the activity period as determined in the applicable certification methodology. *Related to Annex I (a) type of activity and description of the practices and processes covered, including its activity period and monitoring period*
Issue	Article 6(3) states: “The carbon removed and subsequently stored by a carbon removal activity shall be considered released to the atmosphere at the end of the monitoring period, unless that monitoring period is prolonged through a new certification of the activity or the carbon is stored permanently pursuant to paragraph 2a, points (a) and (b), and paragraph 2b, points (a) and (b)..” Not all carbon farming activities have the same level of permanence. SOC sequestration depends on a variety of factors including soil type, soil mineral composition, soil hydrology, microbial activity, carbon and nitrogen cycles, climate, plant species composition, and land management, which can change over time and affect permanence. Most carbon farming practices in agriculture have a risk of reversal and consequent release of carbon as carbon storage in soils is reversable and land management decisions are often taken for shorter time frames. Monitoring beyond the activity period would provide more certainty that carbon storage in the soil is maintained. Conversely, a too long monitoring period will increase costs and raise questions on who should pay for this monitoring and who is

	liable for any carbon release after the activity/certification period. A question for soil carbon removals is whether the carbon farming practice has to be monitored after the project period or that the carbon storage itself should be monitored. The first one is easier to continue to monitor, e.g. by making use of remote sensing and IACS data, while for soil carbon monitoring additional soil samples have to be taken beyond the activity period. **Key question:** What should be the minimum monitoring period? Should the monitoring period be the same as the activity period or should it be longer, and if it should be longer how long would be appropriate for agricultural land management activities?	
Objective	A minimum duration of the monitoring period that ensures contribution to long term storage of carbon in soils and/or biomass, but which is also acceptable to farmers to engage in carbon farming certification programmes.	
Existing certification approaches	According to the review of existing methodologies, 13 methodologies have the same monitoring period as the activity (certification) period, 9 methodologies have a longer monitoring period than the activity period and for 5 it is unclear, as there is no information provided on either the monitoring or activity period. Most of the methodologies based on Verra are using a monitoring period of 30 years, which is 10 years beyond the activity (certification) period. The CAR Soil Enrichment Protocol and Boomitra methodologies even have a monitoring period of 100 years. The CAR Soil Enrichment Protocol issues credits ex-ante only for a 100-year monitoring period, while for shorter periods credits are issued ex-post and a ton-year approach is used (i.e. 1% of the tonnes of CO_2e stored per year). Verra started to develop a long-term monitoring system (LTMS) for loss events and reversals in the post-crediting period of agriculture, forestry, and land use projects that are registered in the Verified Carbon Standard (VCS) Program. The long-term monitoring systems will be used to manage the non-permanence risk of nature-based credits and ensure the transparency and environmental integrity of Verified Carbon Units. The monitoring system will be based on remote sensing with a first test case for forestry, but as it is still in development, it is unclear to what extent agricultural land management practices can be monitored as well.	
Options:	Pros	Cons
Monitoring period can be the same as the activity period	• Lower costs for monitoring	• Higher risk of release of stored carbon • A shorter monitoring period will have an higher uncertainty as the period for detecting changes in SOC stocks is shorter. Consequently the difference in SOC stock is smaller, which makes it more complicated to detect significant changes
Monitoring period should be longer than	• A longer monitoring period will ensure a more long term	• Monitoring can be costly, especially if it cannot be done through remote

the activity period (e.g. 10 years longer)	storage of the carbon in the soil and/or biomass • For practices that are more focussed on maintaining existing stock rather than adding additional carbon, e.g. no till, a longer period would be better to ensure no risk on reversal	sensing. Who will pay for this extra cost? Incentives required.
Preliminary findings	There was no clear majority for one of the options. In some cases, a monitoring period longer than the activity period is needed. Liability mechanisms and incentives should take into account a longer monitoring period. • The approach could depend on the specific carbon farming activities or level of SOC stock. E.g. if SOC stock is near saturation, the monitoring period should be longer than the activity period, as focus is on maintaining the current stock. For activities focussing on building up carbon, a longer monitoring period is less important, as there is an incentive to renew the activity period and continue monitoring to certify additional units. • Geographical differences might make it difficult to set a predefined number of years, the same practice could continue to sequester carbon for many years in some environments, while in other regions an equilibrium could be reached within a limited number of years.	

5.4 Rules for liability mechanisms

Definition	An operator or group of operators shall be subject to appropriate liability mechanisms in order to address any release of the stored carbon occurring during the monitoring period. The rules for this liability mechanism have to be defined. *Related to Annex I (i) rules on appropriate liability mechanisms referred to in Article 6(2), point (b), and Article 6(2b), including rules on the risk of failure of the relevant liability mechanism*
Issue	As stated in Recital 14 of the Regulation, In addition to measures taken to minimise the risk of carbon release into the atmosphere during the monitoring period, appropriate liability mechanisms should be introduced to address cases of reversal. The certification methodologies should also include rules on the risk of failure of the liability mechanisms. Such mechanisms could include collective buffers and up-front insurance mechanisms. For carbon farming activities there are many examples of liability mechanisms from national or private certification schemes that can be considered for the CRCF methodologies. **Key question:** Which liability mechanism is most appropriate for the agricultural land carbon farming activity?

Objective	The development of appropriate liability mechanisms to cover for the case in which carbon is released into the atmosphere during the monitoring period. The following mechanisms are considered: • Discounting of carbon removal units • Collective buffers of carbon removal units • Up-front insurance mechanisms • Other suggestions … (focus group)	
Existing certification approaches	In a buffer pool approach, a certain percentage of the units issued is kept separately in 'pool', which can be shared with other activities or can be used within the activity when certain units cannot be issued or are cancelled due to unforeseen (climate) impacts. If the buffer is not used, the corresponding units can be assigned to the farmers at the end of the activity or monitoring period. In a discount-based approach, a certain percentage of calculated/estimated carbon removals is excluded from carbon certification, which compensates for the uncertainty and potential risk of reversal. This amount is not made available for certification after the activity or monitoring period. In an insurance-based approach, the operator ensures that additional certificates can be bought to compensate in case of carbon losses during the monitoring period. According to the review of existing methodologies, 17 methodologies make use of a buffer pool approach, 6 methodologies use a discount approach and only one methodology (Nori) seems to have an insurance based approach. For two methodologies it is unclear and for one it is stated that there is no liability mechanism. However, it is not always clear from the answers in the survey how the buffer pool is used at the end of the certification period. Therefore, the distinction between the buffer and discount approach might be blurred in practice. Most of the methodologies are using a buffer pool or discount of 10 to 20% of the certified units. Some methodologies start with a 20% discount or buffer pool, which is lowered to 10% in case the activity period is renewed. Verra has an advanced approach for calculating the buffer pool by using a tool for AFOLU related projects to determine the Non-Permanence Risk[6]. This risk scoring considers the internal risks (project management, financial viability, opportunity cost and project longevity), the external risks (land tenure and resource access, community engagement and political risk) and the natural risks. A point system is used to calculate the required buffer pool size. The buffer is in most methodologies only used for carbon removals and not for emission reductions.	
Options:	Pros	Cons
Discounting of carbon removal units	• More certainty that the units correspond to actual carbon removals	• Less incentive for farmers to maintain their practices, as there is no final payment

[6] https://verra.org/wp-content/uploads/AFOLU_Non-Permanence_Risk-Tool_v4.0.pdf

Collective buffers of carbon removal units	• More attractive for farmers as it can serve as a bonus for maintaining their practices • Proven liability mechanism as most existing methodologies use this approach	• If the buffer is paid out after the activity period, there is less certainty that carbon will still be stored after the activity period • Transparent rules are required for the financial management of the buffer pool
Up-front insurance mechanism	• Liability is for the buyer and not for the farmer, which can incentivise farmers to participate in carbon farming projects • Insurance company would be an independent third party	• More uncertain whether new carbon certificates can be purchased if required in case of a carbon release. • Insurance products still have to be developed, which takes time (e.g. risk assessment should be based on historical data)
Preliminary findings	General consensus: a buffer pool is the most robust approach and is applied in most existing mechanisms. A combination with other mechanisms can be applied depending on the level of uncertainty and newly evolving methods (e.g. insurance products). • Discounting can be applied in combination with a buffer to cover for a higher level of uncertainty (e.g. due to a lack of available data), but not as a liability mechanism. • No insurance products are currently available, as historical data would first be required for these products. However, this still can be an interesting option for the future. • The buffer system should be able to cope with large reversals for instance caused by natural disasters, e.g. by aggregating many projects and/or including the possibility to buy from other schemes. • A 'carrot' rather than a 'stick' approach would be preferred, e.g. through a buffer pool through which additional credits are released, which reduces the risk of reversal.	

5.5 Feedback Expert Group on liability topics

The feedback regarding liability mechanisms suggests that the experts favour the use of buffer pools or a combination of mechanisms that can address different issues. In some cases, buffer pools were criticized because of experience with buffers being too small and thus at risk of being depleted. A question is how to reward farmers who maintain practices, and if e.g. some buffer credits will be released. As for discounting, comments suggest that the discount factor should be discussed.

It was mentioned that insurance products are not available, will take time to develop and needs historical data, but some see it as an interesting option in the future. A third party insurance could give better incentives for farmers.

6 Sustainability

6.1 Introduction

Carbon removal activities must preserve or contribute to sustainability objectives such as climate change adaptation, circular economy, water and marine resources, and biodiversity. Carbon removal activities have a strong potential to deliver win-win solutions for sustainability, even if trade-offs cannot be excluded. Therefore, it is appropriate to establish minimum sustainability requirements to ensure that carbon removal activities have a neutral impact or generate co-benefits for the sustainability objectives of climate change mitigation and adaptation, the protection and restoration of biodiversity and ecosystems, the sustainable use and protection of water and marine resources, the transition to a circular economy, and pollution prevention and control.

In the recent provisional agreement on the CRCF regulation, the co-legislators have added indications on how the sustainability objectives must be understood and have included that a carbon farming activity must always generate at least a biodiversity co-benefit (including soil health and avoidance of land degradation).

6.2 Minimum sustainability requirements

Definition	The provisional agreement on the regulations states that an activity shall not significantly harm and may generate co-benefits for one or more of, the following sustainability objectives: a) climate change mitigation beyond the net carbon removal benefit and net soil emission reduction benefit referred to in Article 4(1) and (1a); b) climate change adaptation; c) sustainable use and protection of water and marine resources; d) transition to a circular economy, including the efficient use of sustainably sourced bio-based materials; e) pollution prevention and control; f) protection and restoration of biodiversity and ecosystems including soil health, as well as avoidance of land degradation. (fa) 1a. A carbon farming activity shall at least generate co-benefits for the sustainability objective referred to in point (f) of this paragraph. The minimum sustainability requirements shall take into account the impacts both within and outside the Union and local conditions. Those minimum sustainability requirements shall, where appropriate, be consistent with the technical screening criteria for the 'do no significant harm' principle. The minimum sustainability requirements shall promote the sustainability of forest and agriculture biomass raw material in accordance with the sustainability and GHG saving criteria for biofuels, bioliquids and biomass fuels laid down in Article 29 of Directive (EU) 2018/2001. *Related to Annex I (j) rules on the minimum sustainability requirements referred to in Article 7(2)*

Issue	The specific criteria and indicators for these minimum sustainability requirements are to be laid down in the certification methodologies. There is a need for reliable and possibly quantifiable criteria to assess whether activities have a neutral impact on the sustainability objectives. Currently, there are no widely accepted standard or approved indicators for sustainability specific to agriculture, agriculture management and practices. **Key question:** Which approach should be used to define and assess compliance with the minimum sustainability requirements? a) Which indicators should be used for each of the sustainability objectives? b) Should a list of no harm activities be made?
Objective	A reliable set of criteria and a list of indicators for assessing sustainability requirements for carbon farming activities.
Existing certification approaches	The review of existing methodologies showed that most methodologies make use of the do no-significant harm principle. 18 of the methodologies mention them explicitly, while 8 only indirectly refer to it, by indicating that the certified practices have no negative effects on other sustainability objectives. The sustainability assessment is mostly focused on environmental aspects, while social safeguards are in most schemes not explicitly addressed. Some schemes in agriculture use their own approach to ensure that the certified activity does not harm other environmental objectives. For example, dairy farmers use the global Dairy Sustainability Framework and key global sustainability criteria. Other schemes use stakeholder consultation to address any socio-environmental concerns in the project design before a project is validated and started, while others such as Label Bas Carbone scheme use compliance with the national framework of the Nitrates Directive and measurement and analysis of co-benefits such as on air and water quality, soil erosion, percentage of crops favourable to insects, etc. The **EU Renewable Energy Directive** includes sustainability criteria, mostly focussing on GHG savings, but for agricultural and forest biomass also criteria protecting land with high biodiversity value and land with high-carbon stock. In addition, there is a criterion for agricultural biomass to meet minimum soil quality criteria (i.e. removal of crop residues should not lead to negative soil carbon balance). However, these criteria are mainly of relevance for land use changes, and not directly for carbon farming activities that maintain the same land use. However, none of the existing methodologies has a very explicit framework for the minimum sustainability criteria with clear indicators. The **EU Taxonomy** is the EU's sustainable finance framework for sustainable economic activities[7]. Business activities must satisfy technical screening criteria and Do No Significant Harm (DNSH) criteria to be evaluated for their contribution to, or their no harm on, one of the six objectives: o Climate change mitigation

[7] https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

	○ Climate change adaptation ○ The sustainable use and protection of water and marine resources ○ The transition to a circular economy ○ Pollution prevention and control ○ The protection and restoration of biodiversity and ecosystems These objectives are very similar to those defined for the minimum sustainability criteria in the CRCF provisional agreement, and therefore the DNSH criteria in the Taxonomy Delegated Acts could be the basis for the minimum sustainability requirements where relevant. While agriculture is not yet included in the Annexes of the EU taxonomy, a draft Delegated Act initially included these rules and can still be consulted on the Commission's website.[8]	
Options:	Pros	Cons
Qualitative assessment based on literature or expert judgement	• Less administrative burden • In line with most existing methodologies • No additional development of assessment framework required	• Requires funding of training and advisory services to do proper sustainability assessments • More subjective approach
Positive list of carbon farming practices	• Easy to apply • Low-cost option	• Effects of most practices are context specific, e.g. depending on soil type and crop management. If scientific studies are used as a basis, then it may need adaptation to local conditions • Not all practices will always have a positive or neutral impact on all sustainability requirements, many practices might be excluded • Not in line with a results based approach
Quantitative assessment based on set of criteria and indicators	• Fits well with a result based approach • Could be linked to EU and national monitoring approaches in other environmental fields, e.g. soil health monitoring, water quality monitoring • There are already some existing multi-criteria modelling approaches available (e.g. MeansInOut model or the RISE tool) • Existing scientific studies can be used as a starting point	• Currently no applicable / widely accepted set of sustainability criteria and indicators for farmers • Will increase administrative burden as more data are required • Might require a modelling framework that is not yet widely applicable

[8] "Annex - Ares(2020)6979284" at https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12302-Sustainable-finance-EU-classification-system-for-green-investments_en

	(e.g. van Asselt et. al. (2014), Thivierge et. al. (2014), Dawodu et. al. (2019)) • The science-policy body IPBES recommends the use of multi-criteria analysis for assessing sustainability (e.g. Pascual et. al. (2017), Hill et. al. (2021)	
Preliminary findings	General consensus: a positive / negative list (negative list for 'no harm', positive list for co-benefits) is supported, quantitative assessment is in most cases too complex and not cost efficient. • Farmers are already directed by legislation to prevent harm to the environment (e.g. Nitrates Directive, GAECs). • There should be a minimal list of impacts that should be checked, but preferably based on data that is already collected. Avoid metrics that imply additional data collection. • Quantitative assessment can be applied in case no additional data collection is needed (e.g. assess biodiversity impact on basis of pH and soil cover), however, there is still a need for further development of these kind of quantitative assessments. • Some carbon farming practices might have negative effects on biogeophysical aspects that also affect global warming, e.g. albedo effect countering the impact of cover crops (e.g. Zickfeld et al., 2023). Although the quantification under the CRCF does not comprise these aspects, these could be covered in the negative list of practices or set criteria related to these practices. • The process of including (new) practices on the list should be well thought through, taking into account potential innovations and ensuring that investments are not harmed due to list changes. Quality assurance is needed in case of assessing compliance with the positive / negative list (solid scientific basis). • IMAP database[9] is a good starting point for assessing evidence of potential impacts on other environmental aspects.	

6.3 Monitoring and reporting of co-benefits

According to Recital 17 of the provisional agreement of the Regulation the operators or groups of operators should be able to report co-benefits that contribute to the sustainability objectives beyond the minimum sustainability requirements. To this end, their reporting should comply with the certification methodologies tailored to the different carbon removal activities, developed by the Commission. Certification methodologies should, as much as possible, incentivise the generation of co-benefits for biodiversity going beyond the minimum sustainability requirements, with a view to generate a premium for the certified units, by including for instance positive lists of activities that are deemed to generate co-benefits. These additional co-benefits would give more economic value to the certified units and would result in higher revenues for the operators. In the light of these considerations, it is appropriate for the Commission to prioritise the development of

[9] https://wikis.ec.europa.eu/display/IMAP/Impacts+of+farming+practices+on+environment+and+climate

tailored certification methodologies on carbon farming activities that provide significant co-benefits for biodiversity, and contribute to sustainable management of agricultural land and forests.

The provisional agreement on the CRCF regulation states that a carbon farming activity must always generate at least a biodiversity co-benefit (including soil health and avoidance of land degradation).

Definition	The provisional agreement on the CRCF regulation (Article 7(3)) states that the certification methodologies shall incentivise as much as possible the generation of co-benefits going beyond the minimum sustainability requirements, in particular for the biodiversity and ecosystem restoration objective. The methodology should define how these co-benefits should be assessed and monitored. Where an operator or group of operators reports co-benefits that contribute to the sustainability objectives referred to in paragraph 1 of this Article beyond the minimum sustainability requirements referred to in paragraph 2 of this Article, they shall comply with the certification methodologies set out in the delegated acts adopted pursuant to in Article 8. The certification methodologies shall include elements to incentivise as much as possible the generation of co-benefits going beyond the minimum sustainability requirements, in particular for the objective referred to in paragraph 1, point (f), of this Article. *Related to Annex I (k) rules on the monitoring and reporting of the co-benefits referred to in Article 7(3).*
Issue	Assessing and monitoring the co-benefits is not straightforward and will require additional methodologies. For the quantification of biodiversity, there are currently no widely accepted approaches and indicators that could be used, and there are different views on what biodiversity and ecosystem restoration would comprise. As the provisional agreement on the CRCF regulation included also soil health and avoidance of land degradation, the scope has been broadened beyond biodiversity. The assessment below was however, not focussed on this last two aspects. However, in the proposal for the Soil Monitoring and Resilience Directive indicators for soil health and land degradation are already proposed, and monitoring for these aspects should be aligned with the final outcome of that regulation. In agricultural systems this will be different compared to nature areas. Erisman et al. (2016) developed a conceptual framework which distinguishes between functional agrobiodiversity (nutrient cycling, environmental pressure), landscape diversity, regional diversity (corridors and source areas) and specific species diversity (e.g. red list species). These different aspects of biodiversity require different approaches for monitoring. Therefore, the definition ‘protection and restoration of biodiversity and ecosystems’ might have to be made more specific for each carbon farming activity, or at least be reflected in what should be monitored. **Key question:** Which methodology could be used to certify biodiversity impacts/co-benefits?

Objective	A reliable cost-effective monitoring system to assess and monitor environmental benefits and co-benefits, specifically for biodiversity, soil health, and avoidance of land degradation.
Existing certification approaches	The review of existing methodologies showed that most methodologies mention that the carbon farming practices have several co-benefits, but this is mostly based on literature and stakeholder involvement, and often not monitored. Several methodologies also mention that they contribute to the Sustainable Development Goals (SDGs), but also this is often very generic, and reporting is on a voluntary basis. Only few methodologies seem to have active monitoring of biodiversity or other related indicators: • Trinity NCM does monitor biodiversity, following a scoring system, and water quality, especially nitrogen leaching. The Sandy tool is used for quantification and comprises biodiversity scores across five key categories: Farmland Wildlife, Conservation Species, Natural Enemies, Pollinators, and Soil Biodiversity. The methodology takes into account the full range of land uses and management practices on the farm and has been developed by experts in biodiversity following a Delphi process. • The ReGeneration Soil Carbon Methodology for crediting the increase of SOC is embedded in a set of methodologies on crediting other eco-Benefits, held together by an eco-contribution credit. • Climate Farmers use the biodiversity module of the Cool Farm Tool to monitor biodiversity co-benefits • Label Bas Carbone, based on CAP2ER modelling, includes several environmental indicators. • BioCarbon Registry is an ICROA-endorsed GHG Program, that seems to have a biodiversity tool (was not included in the review of existing methodologies). VERRA has no rules for quantification of co-benefits in their agricultural land management methodology (VM0042), but they do have Climate, Community & Biodiversity (CCB Program) Standards, created to foster the development and marketing of projects that deliver credible and significant climate, community and biodiversity benefits in an integrated, sustainable manner. These standards can be applied to any land management project, including sustainable agriculture, and grassland management, and can be applied exclusively to a project or in conjunction with VCS certification. Alignment of the indicators for the CRCF sustainability objectives with some of the Sustainable Development goal indicators would be another way to link carbon removal activities to biodiversity and sustainability objectives. However, the SDG list of indicators[10] is quite high level, and in most cases not very relevant for activities at farm level. Morrow et al. (2021) gives an example of how the indicators could be used in relation to carbon removal projects.

[10] https://unstats.un.org/sdgs/indicators/indicators-list/

<table>
<tr><td></td><td colspan="2">Ireland has since 2023 an Agri-Climate Rural Environment Scheme (ACRES)[11], in which they also measure biodiversity at farms using a scorecard system. This system is now already used at scale in Ireland and could be a good example.

The examples mentioned above show that there is not yet one approach that can be directly used for the CRCF methodology for agricultural land management. For the Focus Group discussion we proposed to keep a more general discussion on the type of approaches that could be used. Afterwards the selected option can be further elaborated.</td></tr>
<tr><td>Options:</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Use of scoring tools, e.g. Cool Farm Tool, Trinity NCM, Dutch Biodiversity Monitor or Irish ACRES scorecard based on actual changes</td><td>Provides a more objective image of the improvements for biodiversity
Fit for (future) result based payment schemes for biodiversity</td><td>Several tools exist, but there is no agreed standard, different methodologies are behind these tools
These scoring tools are often developed for specific countries/biomes and cannot be directly translated to other regions</td></tr>
<tr><td>Positive list of carbon farming practices with additional biodiversity benefits</td><td>Easy to apply for operators of a carbon farming project
In line with most current methodologies and incentives for biodiversity (e.g. national eco-schemes)</td><td>Uncertain whether the practices lead to actual improvements for biodiversity</td></tr>
<tr><td>Preliminary findings</td><td colspan="2">Due to lack of time, this topic was not discussed extensively during the Focus Group Meeting. Participants were asked to provide written input afterwards.

One suggested approach was to use a combination of remote sensing and on farm data collection, which can already be applied, and the data can help in the development of a cost-effective and scalable methodology for quantitative co-benefit monitoring.

The following metrics/practices can be assessed via remote sensing:
Crop diversity
Riparian buffers (vegetated areas adjacent to rivers and streams)
Presence of agro-ecological practices:
Cover cropping
Soil cover/protection
Conservation tillage (no or low tillage)
Pollinator strips/native vegetation strips/hedgerows
Buffer/filter strips - riparian or non-riparian
Perennial intercropping
Presence of on-farm habitats (forests, wetlands, grasslands, etc.) or intact habitats adjacent to agricultural areas.
The following metrics can be assessed via modelling, with required inputs derived from remote sensing or provided by farmers or carbon removal project implementation partners:</td></tr>
</table>

[11] https://www.gov.ie/en/service/f5a48-agri-climate-rural-environment-scheme-acres/

	• Nutrient runoff (edge-of-field) or loading to water bodies • Sediment runoff (edge-of-field) or loading to water bodies • Surface and groundwater (i.e., blue water) withdrawals

6.4 Feedback Expert Group on sustainability topics

Experts seems to favour a positive list approach to minimum sustainability requirements. Some experts suggest that a positive list is not sufficient and should be combined with a negative list where environmental risks apply. Negative or DNSH lists seem to be a preference. Some experts suggest aligning lists with the draft DA for taxonomy on agriculture. It is mentioned that it might be difficult to establish an EU-wide list due to context specific risks and benefits, and that evolving knowledge of side-effects may lead to burdensome ongoing updating of lists. Experts mention that it is not clear how interplay between practices are assessed. Some experts deem quantitative assessments based on criteria and indicators to be the robust approach, while others find that collecting data from farmers would be too complex, cost inefficient, and burdensome, and would make certification unattractive.

As for co-benefits, there seems to be diverging opinions on both positive lists and remote sensing. On the one hand, monitoring and scoring tools are assessed as administrative costly and unnecessarily complex, especially if benefits are already well-known. On the other hand, it is pointed out that positive lists might not reflect the results of practices, which should be quantified. Experts suggest remote sensing could be costly to farmers not already using the technology. It is also mentioned that it can be used for some practices, but not all, and should be supplemented by random samples.

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Annex 1 Summary feedback Expert Group on Technical Assessment paper

Summary TAP feedback – Eligible activities		
Total contributions: 33		
Options/topic	PRO ARGUMENTS	ARGUMENTS CON/PROBLEMS IDENTIFIED
2.2 Agroforestry. 16 replies, 13 in favour, 2 with questions and seeking clarification on definitions, 1 excluded as opinion		
Include as eligible activity	**TAP:** **Number of comments in favour: 13** Majority of the respondents agree to include agroforestry as an eligible activity, including those with questions and seeking clarifications. **Comments/Reasons pro:** ○ It happens anyway, especially in Mediterranean regions, where ~25% of agricultural land represent agroforestry. ○ It will facilitate combination with other agricultural activities.	**TAP:** **Number of comments against: 0** No outright argument against having agroforestry as an eligible activity. However, concerns are expressed for the need to have safeguards in place to ensure further conventional intensification or the selection of fast growing crops for their sequestration potential is not incentivised. **Reasons con/problems identified:** ○ Careful for the narrow focus on carbon. There is a need for a system change in EU agriculture and land management, not an incomplete measure here and there creating the illusion of sufficient progress. ○ Challenge is how to attribute SOC changes to a particular activity if multiple practices happen on the same patch of land. ○ Boundaries of the concept are not clearly defined.
Aboveground biomass and in-soil C storage	**TAP:** **Number of comments in favour: 2** If the goal is to incentivise agroforestry then both aboveground woody biomass and buildup of soil C, where the farm has introduced agroforestry in place of an existing system, should be considered. Respondents support including changes in aboveground biomass within the scope of carbon farming methodology rather than forestry.	**TAP:** **Number of comments against: 0** **Reasons con/problems identified:** ○

	Comments/Reasons pro: ○ The permanence risk profile for aboveground biomass is different from belowground C sequestration. ○ separate modular assessments are needed to account for the C stored in the biomass (leaves, branches, fruit shells, and in soils (from root exudates). ○ Hedgerow planting and management, and agroforestry are typically undertaken by farmers, and fit more neatly alongside other farm-based regenerative agriculture practices rather than forestry.	
Comments on methodology	**TAP:** **Number of comments in favour: Some** Those who commented on methodology find it crucial to incorporate agroforestry, perennial crops, and hedgerows when developing agricultural land methodologies, which should also include understorey biomass and soil. The respondents favour bringing together **all** practices that contribute to carbon sequestration in mineral soils under one methodology, with clear rules to properly account for the SOC stock balance, taking into account that fertiliser/tillage practices have different effects on SOC stocks under the canopy and in the inter-row. **Comments/Reasons pro:** ○ These aspects are important for the overall C stocks, but also for the impact on biodiversity and ecosystem functions. ○ Having all C sequestration practices in mineral soils under one methodology will contribute to the transparency of the system.	**TAP:** **Number of comments against: 0** There is concern among the respondents that the current path being taken by the technical focus group and the expert group will lead to more complexity and thus non-applicability of the techniques and products. **Reasons con/problems identified:** ○ It is important to strike a balance between applicability and absolute uncertainty of the impact on C removals.
Questions and remarks on agroforestry	**Two questions posed:** ○ Agroforestry is not intensively established in Europe as in other regions. Can the guidelines of agroforestry from more established regions be adapted to European context? ○ It is unclear why administrative burden is higher if a combination of methodologies is used. A combination could also be incentivised and administrative burden kept to a minimum. **General remarks:** ○ While majority of the feedback support agroforestry as an eligible activity, there are concerns over: - Boundaries, which need to be clear.	

	- Clear definitions. - Importance of having a balance between the applicability of the methodology and the absolute certainty of the impact of the practices.	
2.3 Biochar. 17 replies, 12 in favour, 4 not in favour and 1 with a question.		
Include as eligible activity	**TAP:** **Number of comments in favour: 12** Majority of the respondents agree to include biochar as an eligible activity but they do so with caution. There is a general acknowledgement of its climate benefits, while at the same time remarks indicate that it should be viewed critically especially in light of the certification framework, biochar quality, and the accounting methodology. In short, agreement to include, but just as many questions are raised on specificities. **Comments/Reasons pro:** o Take a critical view due to leakage and displacement effects considering the source of biochar (external or coming from the same field).	**TAP:** **Number of comments in against: 4** Four feedbacks do not support having biochar as an eligible carbon farming activity and consider it better suited for storage in products. **Comments/Reasons against** o Derives from external sources therefore does not fulfil additionality criteria. o There is a danger that innate sequestration potential of agricultural soils is reduced or cancelled. Construction materials do not have such effects. o There is a risk of double counting. o Biochar is an industrial solution and should be treated as such, otherwise it opens the door for any industrial solution to be defined as an agricultural activity, which must be avoided (e.g. CDR is happening but clear definition on what is CDR on agricultural land is needed).
Climate benefits / biochar production	**TAP:** **Number of comments in favour: some** There is a cautious optimism of the climate benefits of using biochar as carbon farming practice, but the tones of the feedback is not overly enthusiastic when it comes to the production. **Comments/Reasons pro:** o climate benefits of producing biochar from agricultural residues need to be compared to that of returning straw or using straw for energy production, including other benefits such as nutrient availability, water holding capacity and soil biodiversity.	**TAP:** **Number of comments in against: some** There are doubts on climate benefits. Source of biochar incorporated in a particular field is crucial. **Comments/Reasons against:** o If the source is external, the C from that external pool is reduced. There is no benefit to the climate but simply a transfer in C pool, whereby C is stored but no C sequestration in the sense of additional C fixation.

Rewarding the farmer	**TAP:** **Number of comments in favour: Some** Some feedbacks support rewarding the farmer, as opposed to the producer, through schemes that should be set up so that the beneficiaries of the benefits are the farmers and not those who will supply them with fertilisers. **Comments/Reasons pro:** ○ If producer is not able to sell, then it should not be certified. ○ When sourcing the feedstocks C is lost when farmers deliver biomass to biochar production, therefore they should be incentivised to use biochar on the fields.	**TAP:** **Number of comments in against: 0** While there is no outright resistance to reward farmer, there is acknowledgement that the current development of biochar facilities relies on the monetisation of carbon credit streams at producer level. In such case feedback suggests using a sharing model where some of the biochar is sold "uncredited" to the farmer. **Comments/Reasons against:** ○ A biochar producer should be able to create two streams of biochar - credited and uncredited. How this will work is not elaborated further. ○ Biochar production needs sustainable biomass as a feedstock and could compete with other biomass uses. Again, what the “other” biomass uses are is not elaborated.
Carbon farming practice as opposed to storage in products	**TAP:** **Number of comments in favour: Some** There is support for including biochar application as a carbon farming practice instead of storage in products. **Comments/Reasons pro:** ○ C storage in biochar depends on land management, climatic conditions and soil. ○ Farmer loses C from their fields when they deliver biomass to biochar production, so they should be incentivised to use biochar in the fields.	**TAP:** **Number of comments in against: 0** None against but a comment whether biochar is used in carbon farming or products should not matter. Rather it is the time delay in storing of C that is essential. **Comments/Reasons against:** ○ Biomass in the field will degenerate slowly, while biomass in pyrolysis facilities will emit up to 63% of C during the process.
Issue of double counting	**TAP:** **Number of comments in favour: Some** This is a concern and should be a key priority, regardless of the choice whether biochar is included as a carbon farming measure or in products. **Comments/Reasons pro:** ○ Both options are feasible, but as biochar has multiple use, different streams where multiple accounting is possible have to be rigorously monitored.	**TAP:** **Number of comments in against: 0** **Comments/Reasons against:** ○

	○ Avoiding double counting if biochar is used on fields is already part of carbon farming certification. It is important to ensure consistency with the RED II and national LULUCF inventories.	
Biochar SOC enhancing methodology	**TAP:** **Number of comments in favour: most** There is a general agreement that separate biochar methodology should be used, or multiple methodologies considered rather than just application to agricultural land. The latter would require alignment of relevant modules between the methodologies, including linking to the methodology within National Inventory Reports (NIRs), which would vary depending on the source of biomass used for biochar production. **Comments/Reasons pro:** ○ If biochar-mediated SOC build-up C pool is to be accounted for, then it should follow the approach of other carbon farming measures in agriculture. If pyrogenic C applied to the soil with the biochar is to be accounted for, then an own approach will be required, which could follow the inventory model by Woolf et al. (2021), with updates expected according to the newest findings on higher carbon stability by Sanei et al. (2024). ○ Separate biochar methodologies, with detailed guidance, will allow for differentiating the types of biochar, how they are applied and expected durability of storage, as well as sourcing of the biochar (good quality without contaminants and sustainably sourced biomass, i.e. certified biochar) is required. ○ At a minimum, the methodology and the choice of the certified operator has to include the production stream of the biochar to assess the used biomass and associated emissions. Having the farmer as the certified operator doesn't change the need to certify the producer. ○ On linking to NIRs, if crop residues are used for biochar and returned to the soil, this could be included in the LULUCF sector cropland mineral soils. If the biomass comes from forest	**TAP:** **Number of comments in against: 0** As for agroforestry, there is a concern rather than an outright against methodologies for biochar SOC accounting in getting the balance right between applicability and absolute certainty of the impact of the practice. **Comments/Reasons against:** ○ The current line being taken by the technical focus groups and the expert group must not lead to more complexity and thus non-applicability of these techniques/products in mineral soils.

	residues it makes more sense to use the methodology related to HWP	
Questions and remarks on biochar	**Questions / Need for elaboration:** ○ What does the inclusion of biochar in the agricultural land category imply for the certification of other applications of biochar (e.g. storage in products)? ○ Can the inclusion of biochar under the methodology for agricultural land limit the possibilities of alternative use? The DAA finds it important to leave some flexibility for alternative uses of biochar in situations when it is more suitable than distributing it on agricultural land, and still be able to attribute this usage effects/credits. ○ Elaboration is needed on what the reasoning is behind the finding that it is easier to divide the certificates over producer, supplier and user of the biochar. ○ Elaboration is also needed for the reasoning behind the assumption that this option would be less attractive to farmers – e.g. how are farmers envisioned to be remunerated in this system? **General remarks:** ○ Biochar can be produced to be used for other purposes than agriculture. By limiting the scope to SOC, these options are not considered. Also, another feedback notes that an advantage with spreading biochar on agricultural land compared to using it in short-lived products relates to permanence. But no further explanations are provided for either points.	
2.4 Eligibility of activities. 28 replies.		
Criteria-based activities approach	**TAP:** **Number of comments in favour: most** Majority of respondents support criteria-based approach, including measures that are additional and have an established positive effect on carbon storage. While this could guide priorities for different activities, there is acknowledgement that it will be difficult and time consuming to prepare. There is suggestion that a prioritisation tool with specific selection criteria could be useful for practitioners. **Comments/Reasons pro:** ○ Scientific uncertainties of carbon benefits of many eligible activities. ○ Room for innovation and the development of new technologies / methods to address the problem space, building from the existing criteria. ○ Sets minimum standards to ensure activities have a high mitigation potential, low leakage potential and pose low or no	**TAP:** **Number of comments against: 0** More concerns rather than arguments against. The approach remains unclear, should be sufficiently flexible and practical, and should be sufficiently accurate to capture the effectiveness of the adopted practices, rather than trying to determine effectiveness ex ante and apply exclusions at the methodological level. There is also criticism that this section 2.4 assumes that methodologies are based on practices prescribed, and not effects, which is limiting and premature. **Reasons con/problems identified:** ○ Without examples to illustrate the concept, some criteria-based approach remains unclear. ○ For approach to remain flexible and practical there is strong indication against excluding any SOC practices that farmers are likely to want to adopt, or at least try. This means the requirements of the methodology should encourage new, beneficial agronomic practices, without getting in the way of normal agronomic decision-making by the farmer.

	risk to sustainability, as well as providing guidelines for project developers to demonstrate that their project follows the requirements.	○ It is important that any reduction of yield is not a criterion of exclusion for a carbon farming practice, as this would hinder the development of organic, agroecological and extensive farming practices where in the first years after conversion a reduction in yield is possible before yields stabilise and, depending on the crop type, approach conventional levels again. ○ Take into account context- or location-specific variation regardless of the approach to determining eligible activities. ○ Aim of the approach should be to emphasise effects and designing MRV to observe effects instead of practices.
Negative list / Excluded list of activities approach	**TAP:** **Number of comments in favour: Some, with concerns** There is support for combining criteria-based eligibility criteria where the effect is known with certainty to depend on specific conditions, with “negative list” approach. Practices that are and should be excluded must be done so by defining eligible context and boundary conditions. The list could be structured according to soil types and climatic conditions and can be complemented by a set of additional criteria to allow for new practices, which have not been assessed yet and do not form part of the eligible or non-eligible list, to be taken up as well. **Comments/Reasons pro:** ○ Combining the lists will reduce administrative burden. ○ Having defined context and boundary conditions will help clarify which practices are/are not included. ○ Allowing for new practices will foresee that the negative list of practices do not hinder those that already deliver multiple sustainability criteria.	**TAP:** **Number of comments against: a few** Not all feedback is enthusiastic about negative list and express concerns that it may exclude activities that have regional or project-specific benefits and that the approach is too binary. **Reasons con/problems identified:** ○ Exclusion lists assume little to no innovation, which may not be helpful to the development of novel approaches to incentivise soil carbon sequestration. ○ Relevant if methodology is based on a single practice.
Organic amendment	**TAP:** **Number of comments in favour: 3** Organic amendments have different sequestration efficiency depending on where and what kind of soil they are applied to. Its use is diverse in material and pedoclimatic conditions, therefore having clear criteria on its use is important. **Comments/Reasons pro:**	**TAP:** **Number of comments against: 0** There were no outright views against organic amendments, but concerns that the current approach of the document is not aligned with INMAP, RENURE, Circular economy action plan and others. **Reasons con/problems identified:** ○

	○ Do not fully agree with the conclusion on organic amendments. ○ Having criteria will avoid disqualifying projects that use organic amendments sourced from outside the project boundary.	
Questions and remarks on eligibility of activities	**Questions / Need for elaboration:** ○ The concept of C saturation – although not immediately the case in many fields, too much C at some point will become a problem. The focus will then have to shift from additionality to retention of the carbon sink. Who and how will this be paid? **General remarks:** ○ There is an overall support for eligibility of activities and having clear definitions and boundary conditions are paramount. ○ A competent agricultural advisory and guidance for the farmers/land managers is critical to establish a sound scientific base for the methodologies and scheme, and to implement projects locally and at scale. This should be an essential element.	
2.5 Carbon pools. 14 replies.		
Accounting for subsoil	**TAP:** **Number of comments in favour: Some** Some support for taking subsoil into account, both under no till and conventional soil management, for certain practices and that the requirement should evolve over time to reflect new science. **Comments/Reasons pro:** ○ There is evidence that there is higher C pools under no till in layers below 30 cm. ○ If no/reduced tillage practices are considered than subsoil sampling down to 100 cm should be compulsory as a filter to separate from "free riders" or prevent free riders from handing in a carbon farming project proposal. (p 15)	**TAP:** **Number of comments against:** **Comments/Reasons against:** ○
Sampling depth to 30cm	**TAP:** **Number of comments in favour: majority** Majority support limiting soil analysis to 30 cm depth, but not for all types of activities. However, there are concerns, e.g. if purpose is for monitoring the effect of a carbon farming practice, then more detailed sampling may be needed for some practices.	**TAP:** **Number of comments against: 5** There is strong opposition and disagreement for a fixed sampling depth of 30 cm. **Comments/Reasons against:** ○ To ensure that transfers between top soils and deeper layers are not mistaken for actual net-absorption of C from the atmosphere, >30 cm depth is crucial.

	Comments/Reasons pro: ○ Useful for farmers on the day to day activities. Going deeper increases the cost, is difficult to get to and do not give relevant information for farmers. ○ Sampling procedures and parameters that need to be measured in a consistent manner. ○ In some soils it will be very difficult to sample deeper due to rock (fragments).	○ The ultimate objective is to observe and manage SOC stocks. Therefore the aim for deeper sampling (sub-soil) at appropriate intervals (10-year) should be maintained as guidance. ○ The depth should be extended to 1m in the case of reduced tillage, as with suitable measures, certifiable C gains can be achieved quickly at 30 cm. However, if the subsoil is then depleted of C, this is not C sequestration. ○ Scope should be extended to include subsoil to provide best estimate of actual C removal. ○ Limiting monitoring to topsoil seems to be a practical/financial decision. If environmental integrity and the prevention of greenwashing are the guiding principles for this framework, then only rewards in line with the full picture of climate and environment effect make sense when doing this. ○ If costs of MRV are the main argument and objective, then activity-based methodologies would be better suited.
Questions and remarks on carbon pools	**Questions / Need for elaboration:** ○ None **General remarks:** ○ SOC should be divided into “resilient” and “labile” carbon pools. Only resilient C will contribute to C sequestration, as it is stable over time and therefore informs about sequestration. Labile C is rapidly lost to the atmosphere and poses sampling problems, as they are produced in great quantities by the roots during the growing season and is quicky metabolised. Total SOC is therefore variable in soil.	

Summary TAP feedback – Quantification

Total contributions on Carbon farming: 34. Contributions on carbon farming regarding quantification: 30

Options/topic	PRO ARGUMENTS	ARGUMENTS CON/PROBLEMS IDENTIFIED
3.2 Quantification approaches for soil carbon stock changes. 12 replies.		
Combined/hybrid approach	**TAP:** **Number of comments in favour:** ? a significant number of stakeholders are in favour of a combined or hybrid approach for the quantification of soil carbon changes. **Comments/Reasons pro:** ○ The potential to provide more accurate, reliable, and cost-effective quantification of SOC. ○ Allowing for flexibility and innovation, which are essential for adapting to the diverse and dynamic nature of soil carbon dynamics.	**TAP:** **Number of comments against:** 0 none of the stakeholders explicitly argue against using a combined or hybrid approach for quantifying soil carbon changes. However, some express concerns **Reasons con/problems identified:** ○ careful design and validation needed - ensure effectively mitigate the weaknesses of individual methods and provide reliable, consistent, and comparable results.
Only direct measurement of SOC changes	**TAP:** **Number of comments in favour: 0** However, some emphasize the importance of including direct measurements as part of a hybrid approach. **Comments/Reasons pro:** ○ Concerns on relying solely on other methods. ○ Critical role in any hybrid approach. ○ Accurate, validated, and context-aware data that direct measurements provide, despite the economic and practical challenges associated.	**TAP:** **Number of comments against: Some** **Reasons con/problems identified:** ○ High costs and impracticality. ○ Challenges with assumptions of steady-state baselines ○ Historical data considerations ○ Weather influence ○ Economic and practical feasibility

Only modelling of SOC changes*	**TAP:** **Number of comments in favour: 0** none of the stakeholders explicitly argue in favour of using only modelling **Comments/Reasons pro:** ○ No arguments in favour provided.	**TAP:** **Number of comments against: ?** overwhelmingly argue against using only modelling with diverse set of arguments **Reasons con/problems identified:** ○ importance of empirical measurements ○ limitations of current models
Remote sensing based (direct detection of changes in SOC)*	**TAP:** **Number of comments in favour: 0** Only a few discuss it, and when mentioned its within the context of advocating for a hybrid approach rather than remote sensing alone **Comments/Reasons pro:** ○ due to its current limitations ○ remote sensing, when combined with soil sampling and modelling, can enhance the accuracy and feasibility of SOC change quantification.	**TAP:** **Number of comments against: Several** **Reasons con/problems identified:** ○ current limitations of remote sensing accuracy, the necessity for direct measurements to validate models, and the challenges of solely relying on direct measurements due to cost, feasibility, and natural variations in SOC
3.3 Quantification of 'soil emission reduction' / 'carbon removal'. 13 replies.		
Increase in SOC balance compared to the baseline is considered as carbon removals	**TAP:** **Number of comments in favour: Several** However, also substantial concerns and challenges raised **Comments/Reasons pro:** ○ Using a baseline scenario to account for the positive effects of measures is favored as it avoids the complexity of having separate markets for SOC increases and emission reductions. This approach would treat all improvements uniformly, providing clearer incentives and avoiding perverse market incentives. ○ While recognizing the challenges in empirical measurements, there is agreement on the necessity of including SOC increases as part of the carbon removal certification process, acknowledging that most benefits will be reductions in emissions.	**TAP:** **Number of comments in against: Several** **Comments/Reasons against** ○ accurate measurement, monitoring, and clear definitions to avoid mislabeling and ensure transparency. ○ **Complexity and accuracy:** There is a significant concern about the challenge of accurately distinguishing between reductions and sequestration at the level of the land parcel. The complexity of soil carbon processes and the long timescales required to observe changes in SOC stocks make clear distinctions difficult. ○ **Clear definitions:** A clear distinction between emission reductions and carbon removals is essential to avoid mislabeling and ensure that units issued represent actual changes. The risk of mislabeling units could mislead consumers and investors.

	○ Measures enhancing SOC are often part of long-term strategies and can be both reductions in emissions today and carbon removals in the future, depending on the soil's initial condition and capacity to sequester carbon.	○ **Accounting and monitoring:** Concerns about the ability to accurately measure and monitor SOC increases are highlighted, suggesting that empirical measurements should be required alongside modeling approaches to improve accuracy and prevent over-crediting. ○ **Uncertainty and buffer pools:** The need for buffer pools to account for uncertainties in SOC measurements and the potential for small changes in SOC stocks to be overshadowed by natural variability or measurement errors is emphasized.
	Somewhat consensus: ○ Combination of approaches: A three-component target including gross GHG emission reduction, net contribution of the LULUCF sector, and permanent carbon dioxide removals is suggested as a way to address the dual role of SOC measures. ○ Incentivization and rewards: Having separate targets for emission reductions and carbon sequestration under the LULUCF sector could solve issues related to incentivizing SOC measures that contribute to both reductions and removals. ○ Biochar and double Counting: There is a consensus on including biochar in carbon farming methods while ensuring rigorous monitoring to avoid double counting.	
Only an increase in SOC stock is certified as carbon removal	**TAP:** **Number of comments in favour:** substantial consensus to certifying only the increase in SOC. **Comments/Reasons pro:** ○ **Against separate units**: most experts find separating emissions reductions and carbon removals impractical due to the natural integration of these processes in SOC management. ○ **Empirical measurements**: there is a call for empirical measurements to ensure accuracy and avoid over-crediting, with an acknowledgment of the challenges this poses. ○ **Baseline scenario**: the establishment of a baseline scenario is critical for accurate certification of SOC increases. ○ **Complexity and market dynamics**: Some suggest avoiding the complexity of separate markets and certificates for different types of SOC contributions, preferring a unified approach that considers the net effect of SOC measures. ○	**TAP:** **Number of comments in against: Several** **Comments/Reasons against:** ○ complexities and dual benefits of SOC measures ○ the need for comprehensive accounting that includes emission reductions ○ the challenges of accurate quantification ○ potential market distortions ○ necessity of robust baselines and empirical measurements to ensure credibility and effectiveness.

3.4 Quantification of the direct and indirect emissions. 11 replies.		
Excluding carbon farming practices with high risk on ILUC	**TAP:** **Number of comments in favour:** variety of opinions **Comments/Reasons pro:** ○ On the other hand, there's support for excluding carbon farming practices with high ILUC risk. This viewpoint suggests that if these practices are included, a reassessment is necessary, possibly considering nutritional yield per hectare rather than just production surface. The focus is on mitigating the potential negative impacts of such practices. ○ Some argue for the inclusion of indirect emissions, particularly those occurring outside project boundaries. This includes emissions from changes in crop systems or upstream emissions, though there are also arguments for excluding upstream emissions from crediting schemes.	**TAP:** **Number of comments against:** variety of opinions **Reasons con/problems identified:** ○ Some argue that ILUC can lead to significant emissions and must be robustly accounted for, as mandated by certain regulatory bodies. Excluding ILUC from quantification may contradict the mandate for conservative, accurate, and complete quantification. This perspective emphasizes the importance of addressing ILUC to avoid potential emissions elsewhere. ○ There's acknowledgment of the complexity of ILUC effects and the need for thorough impact assessments rather than avoiding data collection. This perspective emphasizes the need to address ILUC at a systemic level and suggests periodic reviews and the creation of lists of banned practices if necessary.
Quantification of indirect emissions related to ILUC	**TAP:** **Number of comments in favour:** 3 **Comments/Reasons pro:** ○ importance of robustly accounting for ILUC as it can lead to significant emissions. ○ avoiding extensive data collection regarding ILUC effects ○ quantification should adhere to political mandates for conservative, accurate, and complete assessment. ○ minimum requirement of no or minimal negative effects on food production resulting from measures to avoid carbon leakage. taking a long-term perspective on the potential impacts of such measures. ○ indirect emissions can occur if farmers don't include their entire crop system within the project boundaries, suggesting that	**TAP:** **Number of comments against:** 1 implicit **Reasons con/problems identified:**

	quantification should include these emissions to address the issue effectively.	
	General remarks: ○ Need to find a balance between accurately quantifying emissions, addressing potential negative impacts like ILUC, and ensuring that carbon farming practices contribute to broader systemic transformations in the food system. ○ Third option: integrated approach of **Integrated approach with broader food system transformation**: Many argue for an integrated approach that considers the broader transformation of the food system alongside carbon farming. This includes factors like diet change, efficiency improvements, waste reduction, and sustainability issues in food value chains. Without such systemic changes, carbon farming activities may have negative impacts or may not bring about the necessary transformation. ○ There are proposals for addressing leakage issues, such as monitoring emissions from livestock displacement and yield decline. These proposals aim to ensure that any emissions "leaked" outside the project are appropriately accounted for, either by adjusting credits or monitoring long-term yield decline.	
3.5.2 Standardised baseline. 10 replies.		
Use of Pan-EU elaborated dataset (e.g. soil maps , Copernicus data, land cover, ESA CCI biomass maps etc.)	**TAP:** **Number of comments in favour: Some** recognition of the potential benefits, but also concerns **Comments/Reasons pro:** ○ **Pan-EU datasets** can help create a standardized baseline that incorporates social, economic, environmental, and technological circumstances while considering the geographical context. ○ These datasets provide a comprehensive and consistent way to measure and compare SOC across different regions.	**TAP:** **Number of comments against: Some** recognition of the potential benefits, but also concerns **Reasons con/problems identified:** ○ Combining regional baselines with field-level quantification methods might lead to inconsistencies (e.g., comparing apples and pears). ○ There is a risk of generating "phantom credits" or creating inequities where some farmers are unfairly rewarded or penalized based on how the baseline is set. ○ Baselines need to be updated regularly to correct errors and reflect new information and changing drivers. ○ The challenges with MRV and the need for satisfactory methods to build a reliable system.
Use of soil inventories: (At National or local scale, e.g. National	**TAP:** **Number of comments in favour:** 2 explicit, 1 implied Support but also concerns	**TAP:** **Number of comments against:** ? Support but also concerns

inventory data, but also LUCAS soil sampling point data)	**Comments/Reasons pro:** ○ high accuracy, cost-effectiveness, and comprehensive coverage ○ ensures that baselines are grounded in scientifically accurate and region-specific information, reducing the risk of overestimations or underestimations of SOC levels. ○ leveraging existing soil inventories can reduce the cost and complexity associated with establishing new baselines, making it a more feasible option for large-scale implementation. ○ incorporating soil inventory data aligns with broader environmental and agricultural policies (e.g., CAP schemes). ○ national and regional soil inventories provide comprehensive coverage, capturing a wide range of soil types, management practices, and climatic conditions. ○ the use of dynamic baselines, updated regularly based on soil inventory data, can reflect ongoing changes in soil management practices and environmental conditions, ensuring that baselines remain relevant and accurate over time.	**Comments/Reasons against:** ○ variability in SOC levels even within small geographic areas, which could complicate the establishment of standardized baselines. ○ the need for detailed, high-resolution data to capture local soil conditions and management practices, as broad-scale data might not be representative of specific fields or farms. ○ ensuring that the data ownership remains with the farmers and that they can benefit from the information generated is crucial. ○ call for transparency and equitable access to data, avoiding potential exploitation by private entities involved in the MRV process. ○ high uncertainty associated with SOC measurements ○ need for conservative approaches to address estimation uncertainties ○ importance of continuous updates and improvements in quantification methods. The complexity of integrating various data sources and methodologies to create a coherent and scientifically sound baseline
	General concerns on standardised baselines: ○ need for accurate sampling depths. Practices like no-tillage require deeper soil measurements (up to 100 cm) to avoid distorted results that might arise from only considering topsoil changes. ○ inherent variability in SOC measurements and the difficulty of accurately quantifying these changes over small areas, need for conservative methodologies to address these uncertainties. ○ regular updates to baselines are necessary to correct erroneous baselines and reflect changing environmental conditions and climate ambitions. ○ how to fairly reward early adopters of regenerative practices who may not meet additionality requirements due to their already high carbon stocks. ○ developing separate schemes or incentives outside the carbon credit framework to ensure that early adopters are rewarded without compromising the integrity of carbon credits. ○ separation of agricultural land management and energy production (e.g., biogas) in the baseline setting can add unnecessary complexity and burden on farmers. ○ data sovereignty should rest with farmers, ensuring they can benefit from the data and information generated through these systems. ○ need to maintain environmental integrity, the scheme should not compromise on accuracy due to concerns over costs or administrative burdens.	
Remote sensing based datasets of state variables (e.g.	**TAP:** **Number of comments in favour:**	**TAP:** **Number of comments against:**

aboveground stocks) and management activities	**Comments/Reasons pro:** ○ allows for extensive coverage and can capture data across large areas ○ ability to frequently update data can help maintain up-to-date and accurate baselines. This is particularly beneficial in dynamic systems like agriculture where conditions change over time. ○ can significantly reduce the costs associated with traditional, on-the-ground monitoring methods, which are often labor-intensive and expensive. ○ efficiency of data collection and analysis can alleviate administrative burdens and streamline the process of baseline setting. ○ provide a standardized approach to data collection and baseline setting, ensuring consistency across different regions and projects. ○ integration of advanced remote sensing technologies can enhance the accuracy of measurements and improve the quality of data.	**Reasons con/problems identified:** ○ accuracy, fairness, and methodological integrity
	General consensus: ○ balancing the benefits of advanced remote sensing technologies with the need for precise, field-level data and maintaining the environmental integrity of the carbon accounting system.	
Process-based modelling	**TAP:** **Number of comments in favour:** ? Support but significant concerns **Comments/Reasons pro:** ○ can potentially improve the accuracy of SOC quantification while also reducing costs compared to direct measurement ○ Utilizing process-based models can help generate more region-specific baselines, accommodating variables such as region (NUTS 3 level), farm activity type (beef, dairy, arable, etc.), and	**TAP:** **Number of comments against:** ? Support but significant concerns **Reasons con/problems identified:** ○ high variability and uncertainty in SOC measurements, even with process-based modelling. This can lead to inaccurate baselines and misrepresentation of actual carbon removals or emissions reductions. ○ lack of a universally accepted and consolidated method for estimating land carbon fluxes (emissions/removals) poses a challenge.

	regulatory frameworks (organic, agri-environment schemes, CAP schemes). This can lead to more accurate and representative baselines. ○ can help avoid penalizing early adopters of regenerative practices who have already improved their carbon stocks.	○ different models and data sets can yield varying results, making it difficult to standardize baselines accurately. ○ risk of greenwashing, particularly if the process-based models are used to create low baselines that benefit business-as-usual practices. This could undermine the environmental integrity of the scheme. ○ while process-based modelling is seen as a way to reduce costs, it might introduce complexity and administrative burdens.
3.5.3 Activity-specific baseline. 4 replies		
Short reference period (e.g. 3-5years)	**TAP:** **Number of comments in favour:** 1 explicit. Others are in favour of flexibility and context-specific approaches rather than a fixed short period for all scenarios, indicating a preference for adapting the reference period to the specific needs and conditions of the project rather than adhering to a strict short duration universally. **Comments/Reasons pro:** ○ Advocates for a short reference period (the first years after CRCF start) due to the lack of a standardised baseline	**TAP:** **Number of comments against:** 3 implicit. **Reasons con/problems identified:**
	General conclusions: ○ Pre-project reference period is necessary, but no specific duration is mentioned. ○ Different reference periods are advisable based on biogeographical regions. ○ Third option, flexible reference period: need for a pre-project reference period without strict limitations. ○ using a hybrid approach, with no specific reference period mentioned but implies flexibility ○ different reference periods depending on biogeographical conditions, emphasizing the need for context-specific baselines.	
Long reference period (e.g. more than 5 years)	**TAP:** **Number of comments in favour:** 1 implicit Others are in favour of flexibility and context-specific approaches rather than a fixed short period for all scenarios, indicating a preference for adapting the reference period to the specific needs and conditions of the project rather than adhering to a strict short duration universally.	**TAP:** **Number of comments against:** 3 implicit. **Reasons con/problems identified:**

	Comments/Reasons pro: ○ need for longer periods in areas with slower ecological processes.	
3.6 Quantification of statistical uncertainty. 4 replies		
Explicit quantification of statistical uncertainty	**TAP:** **Number of comments in favour:** 4 implicit **Comments/Reasons pro:** ○ explicit quantification is needed to avoid inaccuracies and ensure proper discounting. ○	**TAP:** **Number of comments against:** 0 explicit **Reasons con/problems identified:**
Generic approach for dealing with statistical uncertainty without explicit quantification (e.g., program-wide risk sharing)	**TAP:** **Number of comments in favour:** 0 explicit **Comments/Reasons pro:**	**TAP:** **Number of comments against:** 4 implicit **Reasons con/problems identified:**
	General support on quantifying statistical uncertainty: - Quantifying uncertainties is necessary to perform 'discounting.' Without this quantification, it's impossible to know how much to discount. Emphasizes that ensuring accuracy and trust in the results is more important than issuing a large quantity of units. - Methods should be included based on their proven positive effect on carbon sequestration, considering uncertainties: If uncertainties are large, methods can still be included if the average effect is substantial. Suggests using conservative estimates, such as the lower end of the uncertainty range or a percentage of the mean effect. Highlights the significant risks and costs associated with using only soil measurements due to various factors influencing carbon sequestration. -Uncertainty needs to be quantified to avoid under- or overestimating carbon removals: A generic approach without explicit quantification (e.g., program-wide risk sharing) poses a higher risk of inaccuracies.	

Summary TAP feedback – Additionality		
Total contributions: 20, 3 excluded		
Options/topic	PRO ARGUMENTS	ARGUMENTS CON/PROBLEMS IDENTIFIED
4.2 Additionality rules		
Financial additionality (test)	**TAP:** **Number of comments in favour: 0** There is no outright agreement in favour of financial additionality. **Comments/Reasons pro:** ○	**TAP:** **Number of comments against: at least 2** At least two feedbacks find it irrelevant. There is agreement that there is low trust in the test. There are concerns on the complexity of farm-level application and to consider alternative reasons (e.g. topography or size) why a farm cannot easily adopt a practice while others in the area can. Majority find that finance is not the main barrier of practice adoption but cultural norms and lack of technical advice are, and therefore find it important to include additionality criteria that go beyond and are alternative to financial additionality. **Reasons con/problems identified:** ○ Since most measures are already applied somewhere, financial additionality can no longer be demonstrated. ○ Financial incentive is not the enabler for changing a practice. ○ Non-financial barriers include: - gaining trust and competence in alternative practices, - access to objective data, - competence to do adequate risk assessments, - access to impartial and farm-tailored advice and facilitation of bottom-up knowledge exchange, and - a comparative advantage for practices going beyond C sequestration (e.g. avoidance of synthetic pesticides and fertilisers).

Financial additionality (fund)	**TAP:** **Number of comments in favour: Most** Most respondents favour co-funding or a combination of sources of funding. However, concerns are expressed on the importance of ensuring financial additionality and having maximum public funding thresholds or financial additionality tests in case of public co-funding, and clearly indicating where the co-funding comes from, how much and which part is being co-funded. **Comments/Reasons pro:** ○ Risk sharing. ○ Avoid creating of greenwashing. ○ Avoid double funding, which is currently not explained well in the TAP and needs further elaboration.	**TAP:** **Number of comments against: 1** The existence and use of public support co-funding should logically disqualify activities and practices from CRCF certification. **Reasons con/problems identified:** ○ if co-funding exists and land owners are already using this to fund activities now (e.g. under CAP), can additionality still be considered?
Additionality criteria based on baselines	**TAP:** **Number of comments in favour:** On standardised baseline, there is no outright support but a lot of questions and concerns, while additionality rules in case of activity-specific baselines assume a common practice test. However, more clarity is sought on how exactly the common practice test will work. **Comments/Reasons pro:** ○ Even if a practice is common for some, there may be other production systems within the same region using different crops and where the same measure may not be common. ○ There is already existing support for some carbon farming measures. Additionality should be measured against what would be common practice without the support.	**TAP:** **Number of comments against: Some** Standardised baseline does not make sense. **Reasons con/problems identified:** ○ Difficult to foresee how such a baseline can accurately pick up the specific needs of the land sector. ○ Highly unlikely to be environmentally robust. A strong evidence base will be needed to justify such a decision. ○ There is a lack of data to create baseline at NUTS level, especially member state data on land use and economic performances of specific sectors.
Regulatory additionality	**TAP:** **Number of comments in favour: Some** There is support but further considerations are sought. **Comments/Reasons pro:** ○ Existing regulatory approaches should be made attractive for farmers from different viewpoints such that participation brings economically tangible benefits through other ways, e.g.	**TAP:** **Number of comments against: 0** There is concern that the criteria for additionality going beyond the requirements of existing policy is not coherent given that if farmers are compliant with specific criteria, that is to receive a DP under cross compliance, there is not much more the farmer can do to optimise additionality. **Reasons con/problems identified:** ○

	as yield security or yield increase, increased profit, and savings in inputs. ○ Where a farmer is enrolled in schemes like the CAP, carbon farming scheme practices may help to make available higher CAP support. This is foreseeing future possibility of support levels adjusted by result/outcome.	
Questions and remarks	**Questions:** ○ For early movers who have already achieved high C stocks, wouldn't it be fundamental to reward them? ○ In case of public co-funding and financial additionality tests, how will additionality of projects financed through CAP eco-schemes be estimated, and how can a standardised baseline account for this? ○ If the financial tests are aggregated to a larger scale, the general reference may induce low improvements and disadvantage farmers, making the process unfair; does this not make activity-specific baseline impossible? ○ Should a standardised baseline be dynamic, considering changing climate? **General remarks:** ○ The current approach to additionality feels like a meaningless 'tick the box' exercise. ○ The argument that "In case of an activity that performs better than the standardised baseline, the additionality criteria are considered to be complied with" is not clear and needs to be proved. ○ There is a high level of concern regarding financial additionality, especially heavy or sole reliant on price and market. These are deemed insufficient to overcome the barriers of an agricultural transition and therefore there is a call for projects that bring relevant additionality in non-monetary dimensions to be accepted. ○ If the financial barriers are not the main problem, policy should instead focus on capacity building through advisory services and peer-to-peer learning. ○ Alternatively, should a financial additionality measure be adopted, then consider instituting an appeal process whereby a farmer could petition to determine whether an exception for financial additionality is allowed.	

Summary TAP feedback – Liability

Options/topic	PRO ARGUMENTS	ARGUMENTS CON/PROBLEMS IDENTIFIED
5.4 Option A: Discounting of carbon removal units	**Comments in favour** **Comments/Reasons pro:** ○ Should allow for discounts to manage operator liabilities beyond 100 years to be in line with 100-year permanence for product storage. ○ Relocation/leakage risks should be accounted for by a default discount related to average regional productivity if production decreases by >5%.	**Reasons con/problems identified:** ○ The TAP does not discuss how to set the right discount factor.
5.4 Option B: Collective buffers or accounts of carbon removal units	**Comments in favour** **Comments/Reasons pro:** ○ A big enough buffers or discounts should be enough to manage the risk of a minority of farmers reverting practices to conventional farming. ○ "Best option". ○ Reversal risks should be accounted by a fixed share. Higher rate for shorter projects e.g. 15 % for land management of agriculture and tree crops, 8 % for conversion to permanent herbaceous or trees. ○ Pools should be used not only for liability issues but allow for group certification. Could incentivise compliance longer and help avoid defectors.	**Comments against** **Reasons con/problems identified:** ○ It is not clear how buffer pools reward famers who maintain their practices and carbon levels unless the buffer credits will be released later. ○ The TAP is too positive towards buffers. California forest programme have had bad experiences. What happens if buffer pool is depleted? ○ The TAP does not discuss operators having to remove carbon amount released.
5.4 Option C: Up-front insurance mechanisms		
A combination of mechanisms	**Comments in favour.** ○ Discounting can be applied in combination with a buffer to cover for a higher level of uncertainty (e.g. due to a lack of available data), but not as a liability mechanism. ○ Soil permanence subject to risks like natural events or carbon leakage from LUC to keep agricultural production level. ○ Discounts and buffers can be used to address different issues. ○ Buffer should be used to address natural events risks ○ Discounts to address relocation/leakage risk by either an assessment or a standard factor. See suggestions above.	
Other	**TAP:** For two methodologies it is unclear which approach is used and one methodology does not have liability mechanisms.	

Temporary units	○ Critique and confusion about the concept of temporary credits. ○ CRCF liability is mainly managed by the temporary nature of certificates.
Monitoring periods and liability	○ Monitoring and activity periods are linked to managing buffer pools for quantification uncertainty and reversal risks. Longer monitoring could allow buffer and insurance and give incentive to maintain practices. ○ If a grower exits early liability sits with the project developer to either monitor and demonstrate that no reversals have occurred, or else compensate for the reversal. ○ How will land manager be paid to maintain carbon sink? The buffer should also pay for people exiting earlier.

Summary TAP feedback – Sustainability		
QUESTION/TOPIC	PRO ARGUMENTS	ARGUMENTS CON/PROBLEMS IDENTIFIED
6.2 Qualitative assessment based on literature or expert judgement	**TAP:** Less administrative burden. In line with many existing methodologies. No need to develop new assessment framework**.**	**TAP:** Need funding to training and advisory. More subjective approach.
6.2 Positive list of carbon farming practices	**TAP:** Low cost. Easy to apply. **Amount of comments in favour: 4** **Comments/Reasons pro:** - Establish both a negative and positive list. - Catalogue with nature-based solutions combined with negative list of practices with possible environmental risks - Nature based solutions should be the framework. - A list should be based on clear, transparent criteria. - Align with taxonomy and the draft DA on agriculture.	**TAP:** Most practices **c**ontext specific. (Soil type etc.). Some practices could negatively affect some indicators. Not results based. **Amount of comments against: 2 (3)** **Reasons con/problems identified** - Due to ever evolving knowledge on side effects of agriculture practices a positive list should be continuously updated, which may be a large administrative burden. - Difficult to establish EU wide list. Effects often context specific. - Positive list not sufficient to avoid potentially negative impacts. - Unclear how to asses impacts from multiple practices and their interplay. - Authorities need area-based approach.

Suggested practices and indicators	- Addition of soil improvers and organic fertilisers (and organic matter) with sustainable spreading techniques (fertigation, direct injection, landfill + shedding) should be included as it helps fulfil targets related to reduction in synthetic fertiliser use, eutrophication, ammonia air pollution as well as CH4 and N2O emission. - Consider management techniques to water levels and water use, precision use of fertiliser, agro-forestry, crop rotation and diversity. - Look at Soil Monitoring Law proposal, Annex III for a list of sustainability of agricultural practices. - Additional maximum or minimum application or implementation thresholds to reduce the risk of unsustainable practices.	
Other comments	o Holistic sustainability focus to steer transition and reach green deal objectives needed. o Carbon stored in soils vulnerable to reversals, a clear focus on carbon might neglect or negatively impact other important action points: adaptation, biodiversity and water cycle. Example: Afforestation with few species to maximize carbon sequestration. o Whole farm system approach is needed to avoid intensification and leakage (burden shifting from soil to other aspects). MRV does not fit with practices	
6. 2 Quantitative assessment based on set of criteria and indicators	**Comments in favour.** **Comments/Reasons pro:** - Ecosystem services should be valorised through a sustainability factor of the emission reduction/ carbon removal. - Topsoil level/loss can be modelled with farm data on speed and depth of tillage, length of time that soil is exposed, topography etc. Low top soil loss could be a criteria to issue credits. - Only quantitative assessment will be robust, though complex. - Define a list of quantitative criteria on water, soil, biodiversity, etc. that cannot be degraded.	**Comments against.** **Reasons con/problems identified** - In most cases too complex and not cost efficient. Need of extra data from farmers and administrative burden would make it unattractive for farmers.
Existing indicators to look at	E.g. the CAP'2ER tool by IDELE can provide quantification on indicators. Existing tool: (e.g. MeansInOut model or the RISE tool) Existing definitions, tools etc. e.g. (see links in original text): - 5C by Top farms - Regenerative farming/agriculture by the Baltic Sea Action Group - Svensk kolinlagring and their carbon sequestration methodology	

	- Study by Mattila & Vihanto (2024) Relevant with biodiversity indicators related to soil health and soil degradation. Like in Field Crops and CarbonAgri by low carbon label– COM could investigate these criteria: - pct. of IAE, - diversity of crops - pct. intermediate crops - energy spent on tillage.	
Other comments	- Monitor by proxy/indicator. E.g. months of soil cover. - Define models in line i.a. with the definitions and technical screening criteria for the taxonomy regulation (2020/852). - Regenerative agriculture is clearer defined compared to "sustainable" which is not.	
Negative list / Significant harm (DNSH) list	**Comments in favour.** **Comments/Reasons pro:** - Limit administrative burden. - Should allow for some nuance/flexibility in use of e.g. soil disturbance and herbicides. - The list should include no tillage with herbicide treatment and the use of synthetic nitrification inhibitors. - Minimum requirements need to be coherent with DNSH technical screening criteria and sustainable biomass as in RED art. 29.	**Comments against.** **Reasons con/problems identified** - Need social safeguards on access to land, land speculation, land grabbing. - Suggestion to consider assessment of impacts, effects and leakage outside of EU. - Risk that sustainability is not achieved by minimum safeguards for co-benefits for biodiversity or water quality if to low baseline. - Some root vegetable and horticultural crops require tillage practices. - Align DNSH with crop rotation to ensure it does not incentivise shorter, easier crop rotations instead of longer rotations, which positively effects disease, pest and weed pressure.
Other comments	- Should be based on list of activities that does not require additional data collection. - Suggest a "Yellow list" – allowed under certain circumstances. - Synthetic nitrification inhibitors on negative list. Impacts soil microbial	

	diversity. Long-term effects on soil health uncertain.	
6.3 Use of scoring tools, e.g. Cool Farm Tool, Trinity NCM, Dutch Biodiversity Monitor or Irish ACRES scorecard based on actual changes	**Comments/Reasons pro:** - Scorecard could be optional extra.	**Comments against.** **Reasons con/problems identified:** - Significant cost to achieve ACRES/EIP scorecards. - Why monitor practices with known benefits or monitor impacts. Costly and complex to monitor biodiversity.
	- Ecosystem services should be valorised through a sustainability factor of the emission reduction/ carbon removal. - Monitor by proxy/indicator. E.g. months of soil cover.	
6.3 Positive list of carbon farming practices with additional biodiversity benefits	**Comments in favour.** **Comments/Reasons pro:** - Activity-based positive list with minimum number/area with activities. - Positive list for biodiversity.	**Comments against.** **Reasons con/problems identified:** - Does not go far enough in case of ensuring specific results of practices etc. - Quantifications is needed, and indicators might need to be invented and tested for CRCF.
Other comment:	Suggest use of remote sensing combined with random sample.	
Remote sensing	**Comments in favour.** **Comments/Reasons pro:** - Remote sensing should be combined with random sample.	**Comments against.** **Reasons con/problems identified:** - Remote sensing could be problematic/costly to farmers not already using the technology.

	- Remote sensing algorithms are improving and could be used for some activities but not all.	- Remote sensing can be used for tillage/no-till, but not useful for low impact tillage, and might be difficult to use for crop species mix.
Others	- No single approach to sustainability. Several approaches needed. Credible focus groups identified seven approaches: Identification and management of risks and impacts, Transparent reporting, Stakeholder processes and policies, Land acquisition and land use competition, Activity eligibility conditions, Quantitative monitoring of sustainability, Rewards for sustainability benefits.	

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