EUROPEAN COMMISSION
DIRECTORATE-GENERAL
CLIMATE ACTION
Directorate C – Climate strategy, governance and emissions from non-trading sectors
CLIMA.C.3 – Land Use and Finance for Innovation

2nd Carbon Farming Roundtable

Background document

Contents

Introduction

The 2nd Roundtable on Carbon Farming is a follow up of the **1st Carbon Farming Roundtable**, which was held on 9th October 2019 in Brussels. The first Roundtable brought together about 70 policy, scientific and legal experts, who discussed the main elements of **Carbon Farming** in Europe, with a particular emphasis on **result-based mechanisms**, i.e. payment schemes where farmers are remunerated based on the carbon benefits they provide through their agricultural practices.

During the **2nd Roundtable**, the results of the study "Analytical support for the operationalisation of an EU Carbon Farming Initiative" will be presented. The study, led by COWI and carried out by COWI, Ecologic and the Institute for European Environmental Policy, explored key issues, challenges, trade-offs and design options to develop result-based carbon farming mechanisms, based on the analysis of existing evidence on Carbon Farming initiatives across the EU.

The study focused on five thematic areas: agroforestry, peatlands, grassland, whole-farm audits and the maintenance and enhancement of soil organic carbon in mineral soils. Of these, the discussion in the 2nd Roundtable will mainly focus on carbon farming for **peatlands** and **agroforestry**, also with interventions on **regenerative agriculture**, which are considered the most promising thematic areas at this stage.

The study authors will present their **results and best practice recommendations**, which will be discussed by experts in the implementation and assessment of climate mitigation actions in agriculture, including experts on agricultural soil research and national carbon inventories, as well as practitioners with experience on the ground.

In addition, practitioners will present their **Carbon Farming projects**, and there will be time for discussion with an audience of more than one hundred experts. The experts' feedback will feed into a guidance manual on Carbon Farming that the project team is currently preparing under the lead of IEEP.

During the event, you will have the possibility to take part in short surveys using the event tool Slido. Please go to **www.slido.com** in advance and use the hashtag **#CarbonFarming.** The tool can be used with your computer, tablet or your smartphone. There is no need to download anything or to log in. The moderator will announce different polls during the event. Once a poll is activated, it will automatically open on your screen. If this doesn't happen automatically, please open the tab "poll" manually on your device.

The hashtag that will be used for this event in social media is **#CarbonFarming.**

This document includes background material for the participants to the Roundtable:

- The agenda of the event
- Summaries of the work done by the project team on the five thematic areas
- A summary of the guidance manual
- The short biographies of the speakers

Agenda

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Carbon Farming Initiatives in Europe – 2nd Roundtable

Wednesday 23rd and Thursday 24th September 2020

<u>23 September 2020</u>

Introduction

Welcome to participants. Presentation of the objectives and structure of the roundtable.

09:00 – 09:10 Introduction - Peter Baader (DG AGRI)

09:10 – 09:20 Welcome to participants – Artur Runge-Metzger (DG CLIMA)

09:20 – 09:30 Introductory remarks by DE Council Presidency – Dr. Andreas Täuber (DE Ministry of Agriculture)

Presentation of the project

Introduction to the project, its objectives and scope.

09:30 – 9:45 Introduction to the project 'Analytical support for the operationalisation of an EU Carbon Farming Initiative' - Helle Qwist-Hoffmann (COWI)

Examples on carbon farming

Presentation of ongoing experiences.

9:45 – 9:55 How bottom up initiatives and top-down analysis need to come together to move the agricultural system in Europe towards effective carbon farming - Ivo Degn (Farm-Food-Climate Challenge - Project Together)

9:55 – 10:05 Carbon Farming in the service of public health: evidence from Cyprus – Konstantinos Makris (Cyprus University of Technology)

10:05 – 10.15 Carbon Farming in Europe: from pilot to scale - Dr. Martin Voss (Indigo Ag/The Terraton Initiative)

10:15 – 10:30 Questions, chaired by Peter Baader (DG AGRI)

10:30 - 10:50 Break

Agroforestry

Recommendations on carbon farming mechanisms for agroforestry. Comments from the two discussants, the presenters in the workshop and the other participants.

10:50 - 11:00 Evidence base for agro-forestry and potential carbon-neutral livestock systems: a 30-years replicated trial comparing grassland, silvopastoral and woodland systems in Northern Ireland - Jim McAdam (Queen's University Belfast)

11:00 – 11:20 Carbon farming in agroforestry - Clunie Keenleyside (IEEP)

11:20 – 11:30 Comments on the recommendations on agroforestry - Claire Chenu (The European Joint Programme on Agricultural Soil Research)

11:30 – 11:40 Comments on the recommendations on agroforestry - Rainer Baritz (European Environment Agency)

11:40 – 12:20 Discussion on the recommendations on agroforestry, chaired by Peter Baader (DG AGRI).

12:20 – 12:30 Conclusions - Christine Müller (DG CLIMA)

<u>24 September 2020</u>

Introduction

Main points from the discussion held in the first day and introduction to the second day

9:00 – 9:05 Introduction - Peter Baader (DG AGRI)

9:05 - 9:15 Welcome to participants – Pierre Bascou (DG AGRI)

Rewetting of peatlands

Recommendations on carbon farming mechanisms for peatlands. Comments from the two discussants, the presenters in the workshop and the other participants.

09:15 – 09:25 The concept of carbon farming on peatlands: remuneration and new job profiles – Susanne Abel (Greifswald Mire Centre)

09:25 – 09:45 Carbon farming in peatlands - Asger Strange Olesen (COWI)

09:45 – 09:55 Comments on the recommendations on peatlands - Jens Leifeld (Agroscope)

09:55 – 10:05 Comments on the recommendations on peatlands - Rainer Baritz (European Environment Agency)

10:05 – 10:30 Discussion on the recommendations on peatlands, chaired by Peter Baader (DG AGRI).

10:30 – 11:00 Break

Guidelines

Presentation of the guidelines on carbon farming that are being prepared by the project team. Comments from the two discussants, the presenters in the workshop and the other participants.

11:00 – 11:20 Guidelines on carbon farming - Clunie Keenleyside (IEEP)

11:20 – 12:10 Discussion on the guidelines, chaired by Peter Baader (DG AGRI).

12:10 – 12:30 Wrapping up and conclusions - Christian Holzleitner (DG CLIMA)

Peatland Restoration and Rewetting

Context

As the world largest natural terrestrial carbon store, peatlands are key for combating climate change. Intact peatland plays an important role for the carbon cycle, climate mitigation and provision of ecosystems services due to their role as a permanent water-locked carbon stock and ongoing sink. However, years of unstainable land management practices have resulted in peatland degradation limiting their ability to provide effective climate regulation services. Currently, degraded peatlands emit 2 Gt CO_2 y-1, and are responsible for almost 5% of global total anthropogenic CO_2 emission. From peatland drainage alone around 220 Mt CO_2 eq. are emitted in the EU per year[1]. Restoration, rewetting and conservation of peatlands is therefore an urgent priority in mitigating climate change, as well as in safeguarding the provisioning of other ecosystem services[2].

Case study aim and scope

Results-based carbon farming mechanisms offer a promising way to incentive e.g. governments, authorities and farmers to develop and implement peatland restoration and rewetting projects as they (1) provide a new/additional source of finance to high upfront restoration costs, and (2) provide an opportunity to valorise GHG emissions from large, geographically contracted emission sources based on current carbon credit prices. This case study[3] provides analytical insights and guidance on the most relevant design and implementation options for the operationalisation of peatland carbon faming (CF) mechanisms in an EU context.

<u>Recommended Peatland Mechanism – Summary</u>

Objective: Incentivise peatland restoration and rewetting to avoid emissions and restore SOC.

Scale/coverage: Severely degraded marginal agricultural land with a think peat layer, elimination of trade-offs with Common Agriculture Policy (CAP) payments will enhance scale

Climate actions: Mainly *avoidance of emissions from drainage*, in addition peatlands actively sequester large amounts of carbon, but it is a slow process with low annual increments of carbon.

MRV: Not possible to conduct on-site, continuous monitoring of primary data. Therefore, mechanisms must rely on monitoring of indicators (e.g. GEST method). Internal project level reporting and third-party verification with experts approved by the mechanism. Verification data is shared for scrutiny.

Rewards: Including ecosystem services beyond climate mitigation in the reward system. Currently: GHG benefits are priced, and a premium is achieved for co-benefits. Any new peatland CF mechanism should focus on GHG benefits until experience from MoorFutures and Peatland Code can be adopted.

Funding and governance: Main challenge is related to high implementation cost upfront, grants from charities or governments need to enable cash flow and finance preparatory stakeholder work, etc. Expectedly, future mechanisms may rely on past experiences to reduce costs but would still need to mobilise upfront financial support.

Design principles: If scheme provides offsets for compliance within the non-ETS sector, a more elaborate system with decentralised responsibilities, a central registry and a more market-linked role of farmers is more suitable. However, for voluntary niche CSR based offsetting, a smaller set up can be operated.

[1] Source: Grifswald Mire Centre (2019). https://www.greifswaldmoor.de/files/dokumente/Infopapiere_Briefings/202003_CAP%20Policy%20Brief%20Peatlands%20in%20the%20new%20EU%20Version%204.8.pdf

[2] Source: Joosten et al., (2016). https://assets.cambridge.org/97811070/25189/excerpt/9781107025189_excerpt.pdf

[3] More information on existing peatland mechanisms and initiatives and design options can be found in the case study "*Carbon Farming in organic soils – the case of Peatland Restoration and Rewetting*".

Key recommendations related to mechanism design[4]

Scope and coverage. A change in CAP support to include designated rewetting and restoration projects and a ban on ploughing and drainage of peatlands will increase coverage/scale, and potential enhance the adoption and upscaling of peatland restoration and rewetting actions.

Additionality considerations. While additionality is crucial to maintain the integrity of a scheme, more rigorous rules might lead to lower willingness from project owners to participate. Both cross-compliance with CAP and with GAEC will need to be factored in so that the project activities will be additional across all the criteria. Any CAP payments would have to be deducted to avoid double-payment.

Governance structure: To support the secretariat, at least two committees should be set up. In the development phase, a governing board and a technical advisory committee will be needed. Further, a technical advisory committee of experts and researchers can actively guide and support the e.g. development rules, practices and standards for baselines, additionality, risk buffers, MRV and insurance pricing and sale of credits. Early priority should ensure pilot projects to test and improve methodology drafts and for training of any entity necessary for completing of the foreseen crediting cycle, such as verifiers/auditors, project development technicians and farmers.

Result indicators. Project level result indicators serves as a basis for establishing result-based payments and should ideally be defined early on. Indicators might entail GHG emissions, water table height and/or abundance of vegetation types. If a mechanism is developed in the context of a Rural Development Program or supporting CAP implementation, mechanism level indicators will be needed to be devised in close coordination with relevant authorities. Currently, none of the existing mechanisms incorporate indicators of or quantification of non-carbon benefits into their pricing, rendering the peatland carbon markets one-dimensional with only the mitigation impacts being monetised. It is recommended to further explore possible sustainability indicators at project level to include price premiums for offsets that entail broader socio-economic or environmental co-benefits. Such premiums should not be fixed, but instead reflect the range of co-benefits. Quantification, monitoring and economic evaluation of co-benefits is the next step in the development of carbon credits and can be used to facilitate and incentivise uptake of peatland mechanisms, however resulting in higher MRV costs that needs to be mitigated.

Monitoring, reporting and verification (MRV). It is not feasible to measure data on-site real time for all indicators continuously, so peatland mechanisms should rely partially on modelled data, satellites and drones, spot checks and reference data. Data obtained from inventory operations, local researchers and other projects should be shared frequently to minimize the risk of double counting. To quantify results, the monitoring system should be constructed to match the selection of result indicators (e.g. the GEST method[5]) and the metric for estimating and reporting results. Matching monitoring systems and result indicators however is an exercise that requires technical expertise but is key to a functioning mechanism.

Emission factors (EF) could be determined for each land category by using proxies, reference data and direct measurements in project areas. Planning should allow for 2-4 years for this work. For early, pre-EF assessments, mechanism owners can assume an annual peat decomposition rate of 1 cm to allow the establishment crediting periods and avoided emission potential based on mapped or assumed thickness of remaining peat layers. It is recommended to apply nationally relevant EF as it will allow for initial estimates of GHG potentials from carbon farming.

Reward. It is recommended that peatland projects are developed with the explicit support of the mechanism owners, who are actively involved in all decision processes alongside the deployment of accredited developers. This allows for effective decision-making and flexibility for expansion. It is suggested to quantify and monetise avoided CO_2 and CH_4 emissions, and map document non-carbon benefits tied to a mark-up on price compared to European emissions allowances or voluntary markets. Further, to target potential buyers with local presence or commercial interest, e.g. large companies with branches or clients in the area.

Payment scheme. Allow both ex-ante and ex-post payments/crediting but tie ex-ante to low interest upfront loads without instalments where credits replay payback. To link markets and compliance schemes, it is necessary to prepare and test ex-post crediting. To allow for ex-post crediting in a high upfront cost situation, grants, public guarantees, and long-term partnerships with large commercial buyers are necessary. Apply a discount/buffer of 6-15% of claimable units to be held as security for any ex-ante credits not performing and/or natural disturbance-caused reversals. Domestic market restrictions should be applied where national government cannot deduct any third country exported units from national GHG accounts.

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4 The full 40-page version of the case study provides detailed discussion of all recommendations; it will be published as an annex to the forthcoming guidance document or is available from ana.frelih-larsen@ecologic.eu

5 The GEST method is the most developed and relies on vegetation mapping and classification of peatland into conditions categories. Vegetation is an indicator of the water table height and other plant and site-specific properties.

Conditionalities could e.g. restrict any company with unabated emissions from owned, leased or in-supply chain wetlands to acquire units. On demand users should have green accounting and should transparently report which specific scope 1 emissions are considered compensated.

Base the initial **business model** on crediting of avoided emissions of CO_2, but factor in changes in CH_4 emissions. In a longer-term perspective (+10 years) removals of CO_2 from the atmosphere (carbon dioxide removal (CDR)) may also become viable from a technical, political and economic perspective and should not be ruled out in any chapter, vision or rules of procedure. CO_2 removal may be relevant for both full and partial rewetting projects, though with a 10-50 years crediting delay.

Farmer and landowner should be engaged more to ensure increase buy-in and take-up. Following actions are suggested: (1) creating economic incentives for farmers/landowners by ensuring that peatland rewetting and restoration is more profitable than the status quo; (2) promoting training and consultations to share best practices and bottlenecks; and (3) recognise farmers/landowners as business partners.

Facilitating and promoting adoption and upscaling. In addition to above, it is recommended to promote for broader implementation of non-carbon (co-benefits), as well as ensure co-financing opportunities to cover the upfront implementation (and ongoing operational) costs. Interaction and integration of peatland mechanisms with other initiatives and funding sources, such as exploring options for for integrating carbon markets into multifunctional landscape marketplaces and public funding, are ways in which financing and wider implementation of peatland mechanisms could be scaled up.

Overall conclusion: Avoidance of emissions from peatland drainage is an important mitigation options with significant co-benefits for provisions of ecosystem services. Designing and operation a result-based carbon farming peatland mechanism is a promising and feasible way to incentivize government, authorities and farmers to take effective and efficient climate actions in the EU. Learning from and building on already operational sub-national and national result-based payment peatland mechanism and programmes in the EU can facilitate mechanism development and upscaling in the EU.

Agroforestry

Contex

Agroforestry is the practice of deliberately integrating woody vegetation (trees or shrubs) with crop and/or animal production systems on the same plot of land. Traditional agroforestry systems are highly variable and adapted to local soils, climate conditions and farming systems; examples include large areas of *dehesa* and *montado* on drylands Spain and Portugal, permanent crop and pastoral systems in south-eastern Europe and the wood pastures and *bocage* (hedgerow) landscapes of the northern Member States. More recently, new agroforestry systems have been established on both arable and grassland farms, but it is clear that agroforestry potential is not being exploited and existing long-established systems are under threat.

Compared to conventional production systems, agroforestry contributes significantly to carbon sequestration, increases a range of regulating ecosystem services, and enhances biodiversity. Recent research estimates that introducing agroforestry on arable and grassland where there are already multiple environmental pressures could lead to sequestration of 2.1 to 63.9 million t C a^{-1} (7.78 and 234.85 million t CO_{2eq} a^{-1}). The type of agroforestry adopted will affect both the sequestration potential and the contribution of agroforestry to motigating other environmental pressures (Kay et al, 2019). However, as noted by the IPCC (2019) agroforestry can take more time to deliver GHG benefits than other interventions, and do not continue to sequester carbon indefinitely. Agroforestry systems are also at risk of re-emission associated with poor management and natural events.

Case study aim and scope

Result-based mechanisms for maintaining existing agroforestry systems and for the establishment of new agroforestry are in their infancy. This case study focuses on the potential for the sequestration of carbon in biomass (above and below ground) and in soil associated with the adoption of agroforestry on agricultural land. In GHG sequestration terms, agroforestry represents a micro site, land conversion associated with the introduction additional biomass per unit of land.

Recommended agroforestry mechanism - Summary

Objective: Incentivise management of existing agroforestry systems and creation of new agroforestry systems on agricultural land.

Scale/coverage: Existing long-established agroforestry systems under threat; locations within existing arable, grassland, horticultural and permanent crops systems across the EU, where soils and climatic conditions are appropriate for the introduction of new, locally adapted agroforestry systems.

Climate Actions: Any actions that maintain/enhance or introduce woody components integrated with agricultural production, for the long-term enhancement of C stocks and sequestration potential in biomass and soils, without increasing emissions in the short-term.

MRV: Only indirect methods for infield attribution of C savings linked to above ground biomass, and actual values will depend on the agroforestry system, the end of life use of the timber and local definitions of the baseline for assessment. SOC methodologies are not yet considered fully tested or validated for result-based mechanisms for agroforestry.

> **Step 1a**: existing agroforestry systems: using transect or field audit on-site by specialist advisers, establish baseline assessment of above ground biomass, health of the woody biomass component and its quality in terms of co-objectives (e.g. biodiversity, water). Identify management actions required to meet climate (and other environmental) objectives, whilst maintaining the associated agricultural production system
>
> **Step 1b**: new agroforestry systems: using field audit on-site by specialist advisers, identify the most appropriate location and type of agroforestry system to meet climate (and other environmental) objectives and to fit with the existing agricultural production system. Identify establishment and management actions required to create agroforestry system that meets long-term climate (and other environmental) objectives, and sources of funding. Adviser prepares an establishment and management plan for the woody component, and assists with funding applications.

Step 2: Farmer implements the establishment and management plan, with advisory support, and keep records. Farmer commits to maintaining the system until trees reach maturity.

Step 3: Advisors visit farms at selected intervals to assess establishment quality, health and retention of the woody species, compliance with rules on species choice and the added value in terms of other parameters evaluate and discuss potential adjustments. Intermediate measurement can be taken.

Step 4: All systems will require a long term review cycle, commonly every 5 years, to assess ongoing health and compliance; this should also be linked to advice and knowledge transfer

Rewards: in the case study examples there were two approaches: supply chain reward where farmers are provided with advice and other resources to establish an agroforestry system for tree fruit, while the supermarket providing this support uses the credit to offset their emissions associated with the operation; and carbon credits available to the farmer, used by the purchaser to offset emissions (and retired), or for trading specifically in a local market. An experimental approach using result-indicators for other parameters (e.g. biodiversity) in a *montado* system is still at the development stage.

Design principles: 1) *reduce MRV costs* by focussing on monitoring the quality, robustness and longevity of the tree component (2) *provide financial support for initial establishment and maintenance costs* and make this *conditional upon the use of on-site specialist advice for the first 5 years* (to maximise farmer uptake of the most appropriate agroforestry systems for the locality); (3) *learning-by-doing* through peer-group support and refinement of MRV as improved or more cost efficient methods become available.

Key recommendations related to mechanism design

Overcoming farmer resistance to adopting agroforestry: with the exception of a few Member States (notably France), there has been very limited interest in agroforestry among farmers. Introducing a new component to their business, which requires significant up-front investment and unfamiliar specialist skills, plus adjusting to a tree crop with a rotation cycle so much longer than conventional arable or grassland systems, can be a daunting prospect. Uptake of CAP support for establishment and maintenance of agroforestry systems has been very low.

Improving policy awareness of the significance of existing, traditional agroforestry systems and the multiple environmental benefits these provide: these systems are often part of extensive, low input livestock systems on marginal land of inherently low productivity and not taken fully into account in many Member States' rural land use policies.

Improving institutional co-operation on policy and capacity to support the development of agroforestry: agroforestry may be seen as the responsibility of a different institution, especially when agriculture and forestry responsibilities are separated at government level.

Learning from existing projects: mechanism designers should draw on experience from ongoing initiatives and projects, in particular the Woodland Carbon Code and recent projects testing the use of result-based payments for biodiversity.

Eligibility: all farming systems, other than those on peatland.

Farmer engagement and advisory support: key elements are actively engaging farmers in the mechanism design process and providing authoritative advice from sources trusted by the farmer. It is important that this advice takes an integrated approach to the agronomic, economic and environmental objectives and actions. From outset, training and advisory opportunities should be provided that facilitate farmer learning and capacity building, including peer-to-peer learning.

Additionality: Mechanisms need to aim for environmental additionality (enhanced C sequestration over the long-term that would not have occurred in the absence of the mechanism), regulatory additionality in that project activities go beyond the legal baseline (e.g retention of existing trees and other woody features) and financial additionality (without the mechanism rewards, including for the provision of environmental public goods, the costs of the action would outweigh the benefits).

Results indicators: Currently, most projects focus on the changes in the quality and quantity of the woody element as indicators. Although SOC measurements in agroforestry systems are not suitable as monitoring tools or the basis for payment, opportunities should be taken for co-operation with researchers to evaluate such parameters over the long-term (typically 10-15 years, or until full establishment of the woody element). Monitoring additional benefits (e.g. climate adaptation benefits of shade and shelter for crops and livestock, diversification of income) can be used to facilitate farmer recruitment.

Reward: Depending on the robustness of MRV and the purpose for which the results are used, mechanism designers should consider several options. These can also be seen as stepping-stones through which the mechanism can move as additional result-based and MRV experience accrues: 1) Hybrid scheme: Farmers receive up-front investment support and a guaranteed activity-based payment, with a top-up based on monitoring results; 2) result-based mechanisms/certified credits: farmers are paid solely for the measured or estimated result in changes in woody biomass and/or indicators of other objectives such as biodiversity habitat quality.

Governance: to develop verified, fungible offset credits or verified emissions reduction certificates, a mechanism based on adapting exiting verification standards might be developed e.g. by adapting the Woodland Carbon Code.

Overall Conclusion: existing extensively-managed agroforestry systems are under threat and their agricultural intensification risks increasing GHG emissions, therefore ongoing supportive management is a priority. Introducing new agroforestry within conventional farming systems offers potential for additional climate benefits (for both mitigation and adaptation) and also for a range of other ecosystem and biodiversity services. However, achieving these cost-effectively requires careful selection of locally appropriate systems, and rewarding provision of other environmental public goods, not just GHG emission reduction. Significant advisory, technical and upfront investment support will be required to overcome farmer resistance in many parts of the EU. Result-based mechanisms have yet to be developed and tested for agroforestry, and must take account of the timescale of the time taken to realise the full benefits of the woody element.

References

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Maintaining and enhancing soil organic carbon on mineral soils

Context

Soil organic carbon (SOC) has proven benefits for soil quality, agricultural productivity, and climate mitigation and adaptation. The potential for SOC sequestration in the EU is estimated to be between 9Mt (Frank et al 2015) and 58Mt CO2eq per year (Lugato et al. 2014). Furthermore, maintenance of existing SOC levels is crucial given that many mineral soils continue to lose SOC, i.e. estimated EU annual emissions from mineral soils under cropland are 27MtCO2eq and under grasslands 41MtCO2eq (2016 reporting; EC 2019).

Research and existing SOC initiatives show that farmers can apply a range of management practices to benefit SOC levels, including cover cropping, improved crop rotations, agroforestry, preventing conversion to arable land, conversion to grassland. Many of these practices are cost-effective. The heterogeneity of soils, climatic conditions, existing SOC levels and the management practices, however, mean that the potential for sequestration can vary significantly at farm and plot level.

Case study aim and scope

Result-based carbon farming mechanisms can provide incentives to increase SOC levels by rewarding farmers for improvements in SOC levels. This case study explores steps and considerations for designing and implementing result-based carbon farming mechanisms focused on the maintenance and enhancement of soil organic carbon levels in mineral soils, potentially applicable to arable land, grassland, as well as horticulture and permanent crops.

Recommended SOC sequestration mechanism - Summary

Objective: Incentivise increase in SOC stocks while ensuring that there the overall GHG balance is improved as well.

Scale/coverage: arable land, grassland, horticultural use or permanent crops on any type of farm, with the provision that all applicable land on the farm is included in the mechanism.

Climate Actions: any actions that maintain and increase SOC levels and benefit soil health

MRV: Farm-level monitoring quantifies improvements in SOC levels (t CO_2-e) as a minimum; mechanisms should demonstrate steps taken to quantify the full GHG balance associated with soil management (i.e. GHG emissions associated with tillage or fertiliser application are accounted for) since SOC sequestration also has an emissions component to it.

> **Step 1**: Sufficiently robust baseline level of SOC on the farm is established via sampling and/or calculation.
>
> **Step 2**: Farm advisors/consultants assist farmers to identify management actions to maintain/enhance SOC levels and develop a SOC management strategy for the project period.
>
> **Step 3**: Farmers implement the actions and keep records.
>
> **Step 4**: Advisors visit farms in selected intervals to evaluate and discuss potential adjustments. Intermediate measurement can be taken.
>
> **Step 5:** At the end of the project duration, a final measurement takes place.
>
> **Step 6**: Farmer commits to maintaining the levels for at least 5 years after receiving the last payment

Rewards: Farmers are rewarded at a set rate of € per t of sequestered carbon, as long as they meet eligibility criteria. To reduce the risk for farmers and increase the rates of uptake, a hybrid model may be necessary, whereby farmers are paid for management changes topped up with a bonus for amount of t CO_2-e sequestered.

Design principles: 1) *reduce MRV costs* while maintaining robustness (2) *shift costs away from farmers* (to maximise farmer uptake and decrease overall scheme costs); (3) *learning-by-doing* through refinement of MRV as improved or more cost efficient methods become available.

Key recommendations related to mechanism design[6]

Learning from existing projects and methodologies: Mechanism designers should draw on experience from ongoing initiatives and projects, in particular from French Carbon Agri SOC methodology (expected Autumn 2020), Indigo AG Carbon Pilot (draft methodology open for consultation[7]), Gold Standard SOC Framework Methodology, Ebenrain Humusprojekt and Solothurn Project in Switzerland, LIFE Carbon Farming Project in Finland, CarboCert Germany, Kaindorf Humuszertifikate). Moreover, FAO is preparing guidelines for SOC MRV that should be considered.

Scope and knowledge basis: The mechanism focuses on mineral soils, including under cropland, horticultural land, grassland and in agroforestry systems (including permanent crops). It is advised to have assessments of the existing SOC levels and expected potential at national / regional scale, as well as more granular understanding of what management practices lead to the greatest SOC sequestration and with what effect. These assessments can also be integrated as research components of pilot scheme developments. They enable targeting of SOC activities to areas with the highest potential for

6 The full 40-page version of the case study provides detailed discussion of all recommendations; it will be published as an annex to the forthcoming guidance document or is available from ana.frelih-larsen@ecologic.eu

7 Methodology for improved agricultural management, currently under consultation with Verra (https://verra.org/wp-content/uploads/2020/06/Methodology-for-Improved-Agricultural-Land-Management-5JUNE2020.pdf)

SOC increase, for example degraded soils or soils that are far from saturation potential. Finally, they provides guidance for directing efforts in terms of the design of result-based mechanisms (for example, in setting payment levels or eligibility criteria). Where the potential for C sequestration is large (the change occurs faster and the total amount of C sequestered leads to higher reward) this leads to improved reward – transaction cost ratio and mechanism uptake.

Eligibility: The mechanism should operate on the same selection of land through the whole duration of the project. It is also recommended that a whole farm approach is taken, i.e. all mineral soils and eligible land use types on the farm are included in the project. This will avoid that increase in SOC in one part of the farm is offset with losses on another part.

Uncertainties and MRV costs: Two main approaches for setting the baseline and monitoring of SOC changes are available: measurement approach via sampling and estimation approach via combined sampling and modelling. In both cases, costs are currently high, posing barrier to mechanism feasibility. However, several initiatives and technological developments are ongoing that are anticipated to reduce these costs over the coming years. In the meantime, the mechanism designers should ensure that the uncertainty level is clearly acknowledged and addressed in the reward / buffer element of the mechanism. As new technological developments that have potential to reduce costs of MRV and increase certainty in assessments are available, these should be utilized. MRV costs borne by farmers should be kept low.

Building knowledge: Having sufficient detailed knowledge on the potential saturation levels enables mechanism designer to better set the reward values and understand the economic costs – benefits of a project in a given area. If this knowledge is not available from the outset, this knowledge can be generated during the project duration. Data generated by applying the mechanism should be stored and used to evaluate and improve knowledge on SOC levels, and can be used to ground-truth and train models.

Farmer engagement: Actively engaging farmers in the mechanism design process and regularly consulting them through the operation can increase farmer buy-in and up-take. Since economic incentives are a key first attractor for farmers, costs borne by farmers can be kept low by accepting greater uncertainty and therefore relaxing MRV, simplifying design (e.g. by restricting participant eligibility to similar participants), or by investing upfront to reduce ongoing transaction costs to farmers. Increased media and public interest in climate issues can increase farmer interest; however, new knowledge and skills are also needed. The mechanism should integrate from outset training and advisory opportunities that facilitate farmer learning, including peer-to-peer learning.

Additionality: Mechanisms need to aim for environmental additionality (climate actions that would not have occurred in the absence of the mechanism and that lead to improved SOC levels), regulatory additionality (project activities go beyond what is required by law) and financial additionality (without the mechanism rewards, the costs of the action would outweigh the benefits).

Results indicators: Currently, the projects mostly focus on the changes in SOC levels as the key result indicator. However, the mechanisms should move towards accounting for the whole GHG balance associated with increasing SOC levels to ensure that the full climate impact is captured (including CO_2, CH_4 and N_20 emissions associated with soil management). Monitoring additional benefits (in particular yield, water holding capacity, economic efficiency) can be used to facilitate farmer recruitment.

Crediting period: The choice of the period should be adjusted depending on the anticipated time that expected changes can potentially be observed in the specific biophysical and climate context. This should be based on published peer-reviewed scientific results. In general, 5 years is the minimum commitment period set by existing projects. The crediting period can vary from 5 – 20 years.

Non-permanence and buffers: A buffer account should be used as a carbon credit reserve to cover any unintentional reversals. These buffers can be general (i.e. a % set aside from all reductions) or targeted, i.e. for a % set aside for especially uncertain types of farms e.g. farms that only complete less stringent MRV may have a higher % buffer.

Reward: Depending on the robustness of MRV and the purpose for which the results are used, mechanism designers should consider several options. These can also be seen as stepping-stones through which the mechanism can move as additional knowledge / MRV capacity and experience are gathered: 1) Payments are calculated based on the expected result of a menu of measures from which the farmer gets to choose. SOC levels are monitored on a subsample of farms so that the overall project impact and measure impact can be estimated. 2) Hybrid scheme: Farmers receive a guaranteed payment up-front (activity-based). A top-up is paid based on monitoring results, rewarding the difference between upfront, activity-based, payment and total result. 3) Result-based mechanisms/certified credits: Farmers are paid solely for the measured or estimated result in changes in SOC levels on an ex-post basis.

Paying farmers **a set payment per tonne** of C sequestered over the project period supports farmer uptake, as it reduces their price uncertainty and increases attractiveness of the mechanism.

Funding and Governance: If mechanisms want to develop verified, fungible offset credits or verified emissions reduction certificates, mechanisms must meet the standards set by external verifying authorities (for example, Label Bas Carbon, Gold Standard, Verra). Mechanisms can also seek external funding without having external verification. Mechanisms that do not seek external funding can be more flexible in their governance.

Overall Conclusion: SOC maintenance and sequestration is an important mitigation option with significant co-benefits for agriculture and ecosystem health. High MRV costs and uncertainty associated with sequestration potential / impact at farm / field level pose a barrier to result-based mechanisms. Ongoing technological developments, increasing knowledge base (on more granular potentials and impacts) and learning-by-doing approach from more activity-based to hybrid and fully result-based mechanisms can facilitate mechanism development.

Grasslands

Context

Grasslands cover more than a third of the total agricultural area in Europe, and constitute a significant carbon storage, and potential sink, within the European context. However, depending on the management, modifying or converting grasslands also has the potential to emit significant emissions. In addition to the climate impacts, sustainable grassland management can deliver significant other eco-system services, including biodiversity conservation and improved soil productivity and pasture yields. These co-benefits are important considerations when designing sustainable grasslands initiatives.

Case study aim and scope

The grasslands case study presents the implementation design considerations of result-based payment initiatives for the delivery of climate benefits through grassland management, which can maintain and increase soil organic carbon (SOC) storage, plus avoid emission from conversion of grasslands to cropland.

Grasslands are diverse, in terms of agri-ecology, usage (e.g. grazing, no-grazing), socio-economic value, etc. For simplicity, and in order to be able to arrive at applicable guidance for setting up grasslands initiatives, we consider four overall categories of grasslands that we need to take into account when discussing C-sequestration on grasslands. This includes the ongoing management of existing grasslands, conversion of 'fallow/set-aside' areas to grasslands, the replacement of annual cropland by grassland, including marginal arable lands such as sloping land or shallow soils, which are especially suitable for grasslands management; as well as avoided emission from avoided conversion of grasslands to arable land on soils that are suitable for cultivation.

Arriving at reliable and useful estimations of carbon sequestered for a rewarding system on grasslands is complex for a number of reasons: climate benefits differ depending on the soil type, the climate, previous land use and subsequent management practices (e.g. fertilizer input, soil disturbance and grazing intensity). Furthermore, to ensure permanence, grasslands need to be maintained for a long period of time, typically for decades, with minimum disturbance (cultivation and re-seeding will release some of the carbon that has been sequestered). The fact that there are only a few results-based initiatives (current or past) paying for carbon sequestration on grasslands in Europe to learn from, adds to the positive challenge of designing feasible initiatives. Most existing results-based schemes on grasslands focus on biodiversity enhancement. Therefore, the grasslands case study is based on a literature review of these (mainly biodiversity enhancement) initiatives combined with insights gained from interviews with existing developers, practitioners and the scientific community involved in grasslands management.

<u>Recommended agroforesty mechanism – Summary</u>

Objective: incentivise avoided emission, maintenance and enhancement of soil organic carbon on grasslands.

Scale/coverage: there are four main categories to consider for rewards-based carbon sequestration initiatives on grasslands:

1) permanent grasslands;
2) conversion of fallow/'set-aside' areas to grasslands;
3) arable land being converted to grassland;
4) avoided emission from grasslands remaining grasslands (i.e. grasslands not being converted to arable land, though the land is suitable for arable farming).

Climate actions: all actions that maintain and/or increase carbon content on grasslands and do not have adverse impact on other ecosystem services like biodiversity and socio-economic services.

Design principles:

- Action-oriented, farmer-centred design that is based on the local natural agro-ecological context– actively engaging farmers in the actual design of the initiative
- Recognizing co-benefits enhances farmers ability to relate and to see where they can improve their management practices to increase carbon sequestration
- Local anchorage with a trusted advisory service as the initiative manager is preferable.
- Minimising MRV costs;

- Simplify administrative procedures and shift costs away from farmers (to minimise transaction costs and maximise farmer uptake and permanence and);
- Action-oriented learning-by-doing – any mechanism set-up needs to be tailored to the local context (socio-economic as well as overall agro-ecological contexts, soils and climate, etc.) - and evaluated and improved based on experience.

MRV: the selection of MRV approach --direct and/or indirect SOC measurement with sample verifications, and/or the use of proxy-indicators and determined carbon sequestration factors based on management conditions-- and the acceptable level of uncertainty, determine the level, complexity and costs of the MRV set-up. The basic principle, however, remains that the administration and costs to the farmers should be minimized, and usability and transparency optimized.

A robust, yet realistic (i.e. efficient and not overly burdensome) MRV would include:

- Initial farm baseline setting, where initiative advisors in dialogue with farmers establish a baseline level of SOC, agree on relevant indicators (proxy and/or actual changes in SOC) and agrees on management actions (carbon sequestration factors) to maintain/enhance SOC levels on the farm's grassland.
- Farmers implement the agreed management actions (carbon sequestration factors); keep records and send in reports according to agreed reporting requirements.
- The farm is visited at least twice a year where status of carbon sequestration factors is 'measured', opportunities discussed and obstacles addressed.
- C-sequestration levels assessed (based on the above-indicated indicators and compliance requirements) and paid once a year during the 10 years of the life of the initiative.

Rewards: A hybrid model with a combination of action-based and results-based payment is recommended – so that investments, efforts and management changes towards increased carbon sequestration are recognized and rewarded, plus actual carbon sequestered is rewarded based on indirect SOC measurements and proxy-indicators. This part of the payment would be based on a set rate of € per t of sequestered carbon, as long as eligibility and compliance criteria are met.

Funding and governance: Grasslands mechanisms can potentially be funded by public funds, as part of private sector supply chain efforts, or through external sales of credits/certificates. The governance and MRV requirements will vary according to the type of funding and payment mechanism.

Overall Conclusion: Despite the challenges, and the doubts with regards to cost-effectiveness, etc., the size of land under grasslands in Europe and the overall potential for additional carbon sequestration under grasslands, and avoided emission from grasslands converted to cropland, warrant an exploration of the options for settting up carbon sequatration rewarding initiatives for grasslands.

Livestock Carbon Audit

Context

European livestock – such as beef, dairy, sheep and pork farms - directly generate 5.7% of Europe's GHG emissions[8]. On-farm climate actions can cost-effectively reduce livestock GHG emissions, such as herd management and feeding, animal waste management, crop management, consumption of fertiliser and energy, among others. International research and existing European demonstration projects suggest that by applying these climate actions European livestock farms could potentially reduce their emissions by 12-30% by 2030. Result-based carbon farming mechanisms offer a promising way to incentivise farmers to take effective and efficient climate actions on their farms, because the farmer gets paid in accordance with the amount of GHG emissions reductions they achieve (i.e. there is a direct link between their reward and the actual impact they have on the climate). One promising method depends on a **whole farm carbon audit tool** - a computer model/programme that calculates a farm's GHG emissions (and other indicators such as nitrogen balance, economic measures) based on input data that summarises the farms management (e.g. animal number and type, feed type, etc.); existing examples include CAP2'ER, Solagro, Cool Farm Tool.

Case study aim and scope

This case study outlines **how a farm carbon audit tool can form the basis of a result-based mechanism to incentivise emissions reductions on European livestock farms.** It focuses on reductions below a baseline level of emissions and excludes carbon sequestration in e.g. soil carbon or agroforestry (covered in other case studies). The mechanism discusses all elements for implementation, including monitoring, reporting, and verification, mechanism scope and participant eligibility, baseline setting and additionality, reward calculation, monetisation of emissions reductions (e.g. offset credits), governance, and other elements.

<u>Recommended Livestock Carbon Audit Mechanism - Summary</u>

Objective: Incentivise voluntary GHG emissions reductions on livestock farms

Scale/coverage: whole livestock farms (any that can be robustly measured by farm audit tool) i.e. could include dairy, sheep, beef, goats in diverse geographic contexts.

Climate actions: any actions to avoid emissions that can be robustly measured by audit tool. *Note: excluding carbon sequestration or storage (due to uncertainty and permanence risk).*

MRV: Farm carbon audit tool quantifies whole farm GHG emissions (t CO_2-e):

> **Step 1:** Trained farm consultants visit the farm and calculate a baseline emissions level (and to identify climate actions to avoid emissions).
>
> **Step 2:** Farmer implements the actions and keeps records.
>
> **Step 3:** After five years, a consultant visits the farm again to calculate emissions reductions over the period.

Rewards: Farmer rewarded at a set rate of € per t of emissions reductions, as long as they meet eligibility criteria (including "doing no harm" to other environmental and socio-economic indicators) (i.e. farmer does not receive offset credits or certificates).

Funding and governance: *Either* publically, internally within a company, or by external sale of offset credits/certificates. This funding decision would determine governance requirements.

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[8] This includes enteric fermentation and manure but excludes soils and land use, land use change and forestry (European Environmental Agency, 2020). If these and indirect emissions are included, European agricultural emissions are equivalent to approximately 20% of EU total emissions.

Recommendations related to upfront decisions[9]

Two key up-front decision overwhelmingly shape mechanism design: 1. The selection of farm audit tool, 2. The level of environmental uncertainty to accept.

1 - Farm carbon audit tools estimate GHG emissions (i.e. baseline) and emissions reductions (i.e. results) with moderate levels of robustness for many EU farm types and on-farm climate mitigation actions. A number of similarly reliable farm carbon audit tools are already available, while some mechanisms have custom built their own audit tools. Alternatively, audit tools are increasingly being designed in such a way that they can be paramerterised or extended to different local contexts or different types of farms. Tool accuracy increases with relevant scientific data (i.e. higher for estimating methane emissions for livestock in French farms than estimating soil carbon storage in Romanian farms). Emissions reductions (i.e. avoided emissions) can be more reliably estimated than carbon storage or sequestration due to higher scientific certainty (and no permanence issues). While interviewees considered these tools relatively robust, because the tools are models based on experimental data rather than measurement it is very difficult to quantify the uncertainty of audit tool estimates.

2 – Environmental uncertainty: Mechanism designers and participants face and must accept some degree of **environmental uncertainty** in the estimated emissions reductions. This uncertainty arises due to farm audit tool calculation methods (e.g. reliance on average emissions factors), input data monitoring and inputting, and other mechanism design elements. Up to a point, mechanism designers can reduce uncertainty through more stringent mechanism requirements (e.g. strict verification, conservative audit tool calculation assumptions, etc.); however, this comes with a trade-off: cost, which will decrease net benefit of the mechanism and reduce farmer uptake.

Mechanism designers must also consider the following **additional upfront considerations**:

- **Funding approach**: i.e. will the emissions reductions be sold as offset credits or financed by external parties? If yes, this can demand stringent environmental certainty/tool robustness and, costly MRV.

- **Scope and coverage**: what types of farms and climate mitigation actions, and what geographic context will be targeted? The farm carbon audit tool must be able to estimate baseline emissions and reductions on the target types of farms (e.g. beef cattle), in the geographic context (e.g. Brittany), and impact of climate actions (e.g. efficiency improvements) at an acceptable level of environmental certainty.

- **Objectives:** i.e. does the mechanism aim just at emissions reductions, or also other negative externalities (e.g. nitrogen runoff), or co-benefits (e.g. biodiversity outcomes or farmer income)?

Recommendations related to mechanism design

Generally, **there is no one-size-fits-all design**. Local context and objectives will determine the "best" type of mechanism in each case (i.e. tool, level of environmental uncertainty, type and timing of farmer reward, etc.). Many design decision have trade-offs, which will need to be weighed up given that local context. Given that the mechanism is voluntary, the mechanism should aim to keep costs low to **increase farmer uptake**. Costs can be kept low by accepting greater uncertainty and therefore relaxing MRV, simplifying design (e.g. by restricting participant eligibility to similar participants), or by investing upfront to reduce ongoing transaction costs to farmers. Generally, the mechanism should reduce farmer transaction costs to boost uptake. Farm consultants and farmers will be key recruiters of other farmers. Higher farmer and stakeholder engagement and involvement will be important for design, feedback, and uptake of mechanism.

Additionality recommendation: Emissions reductions are additional if the mechanism induces action that would not otherwise have occurred. We propose considering all reductions below a historical emissions baseline as additional. To set baselines, consultants run the farm audit tool on the individual farm on historical data (e.g. previous year). The mechanism can manage carbon leakage by discounting estimated emissions (i.e. awarding less than are estimated). Financial additionality tests are not appropriate for this mechanism. During the baseline setting, the consultant will identify mitigation options for the farmer, educating and training the farmer.

Farmer rewards should be based on absolute emissions reductions, rather than intensity gains, to ensure real climate impact. Other secondary objectives (i.e. co-benefits, negative externalities, e.g. environmental, socio-economic, food production objectives) can be monitored by farm audit tools but should not be the primary focus of the mechanism;

[9] The full 51-page version of the case study provides detailed discussion of all recommendations; it will be published as an annex to the forthcoming guidance document or is available from hugh.mcdonald@ecologic.eu

mechanisms could have a do-no-harm eligibility requirement for secondary objectives. Secondary objectives should be monitored and evaluated at the project level.

Farmers should receive a set reward price per tonne of carbon reduced. This decreases farmer uncertainty and transaction costs relative to being rewarded tradeable credits, which will increase uptake. To boost farmer uptake, pay some portion of expected impacts upfront and also highlight significant efficiency gains (which can be double carbon payments).

Monitoring, reporting, and verification should depend exclusively on the farm carbon audit tool (no on-site testing) with random audits and high penalties for non-compliance. To reduce MRV costs, align data inputs with CAP reporting and existing data gathered, as far as possible. The under-development Farming Sustainability Tool (FaST) could be a source of data/MRV or even build in a have a whole farm carbon audit module.

Recommendations regarding funding, governance, and upscaling

Externally funding the mechanism by selling fungible offset credits or non-tradeable emissions certificates demands high environmental certainty, which demands stringent MRV, external verification, and/or reputation. The trade-off of high transaction costs may be “cripplingly expensive” and undermine uptake and the impact of the mechanism.

Learning-by-doing has been central to the development of existing mechanisms (e.g. Carbon Agri, Woodland Carbon Code, MoorFutures). It is through the process of implementing their mechanism that barriers and solutions were identified, and trade-offs and costs and benefits became measureable. Accordingly, mechanisms must have evaluation processes (e.g. stakeholder review and monitoring of impact on GHG emissions and other secondary objectives) and high transparency.

Upscaling should occur at the local level, as local context (objectives, trade-offs, geographical context, farm types) will determine “optimal” mechanism design. Mechanisms should target areas/farm types where there is robust audit tool coverage, large sources of emissions, and cost-efficient mitigation options. Mechanisms rely on skilled/trained farm consultants and farmer interest. Involving stakeholders in design/evaluation supports efficient, effective, high-uptake mechanisms.

At the **European scale, upscaling** will be supported by knowledge sharing and networking. This includes exchange between existing and in-development mechanisms and participants, and ongoing scientific development/validation of farm carbon audit tools. The Biodiversity 2030 and Farm to Fork Strategies, as well as ecoschemes in the new CAP, offer opportunities to develop local mechanisms.

Overall Conclusion: There is sufficient knowledge, experience, and technical capacity to develop result-based carbon farming mechanisms to incentivise emissions reductions on European livestock farms using whole-farm carbon audit tools. However, due to the importance of local context, there is no one-size-fits-all approach. Accordingly, mechanisms must build ongoing evaluation and adaptation, including stakeholder engagement, into mechanism development and implementation.

Guidance on result-based carbon farming mechanisms

Purpose**:** to provide guidance on setting up, implementing and evaluating result-based mechanisms for carbon farming in the EU.

Intended audience: those seeking to set up result-based mechanisms (or pilot schemes) for carbon farming using public and/or private sources of finance; these including public authorities (CAP managing authorities), agricultural advisers, researchers and consultants.

Format and content: the guidance covers the distinct methodological steps appropriate to a range of different carbon farming schemes:

1. Introduction
2. First steps – assessing feasibility, resource needs and scale
3. Setting up a results-based carbon farming mechanism - key design elements
   - potential sources of funding
   - objective setting and eligibility
   - choosing result indicators
   - monitoring, reporting and verification (MRV)
   - establishing the payment
   - ensuring permanence
   - approaches to non-compliance and fraud
   - evaluation of result-based carbon farming mechanisms
4. Stakeholder engagement, capacity building and transparency
5. Upscaling

The text will include **key messages**, **decision trees** summarising critical decision points, **examples from the case studies** and a list of **useful additional resources**. The **five case study reports will be Annexes** to the main guidance document.

The guidance will be **compatible with the proposed legislative changes to the CAP** and the focus on the green architecture and Member States' CAP Strategic Plans.

The guidance will include a **feasibility assessment** to help practitioners decide whether result-based carbon farming is appropriate (see Figure 1 and 2).

The structure of the guidance is shown in Figure 3.

Figure 1. Feasibility assessment

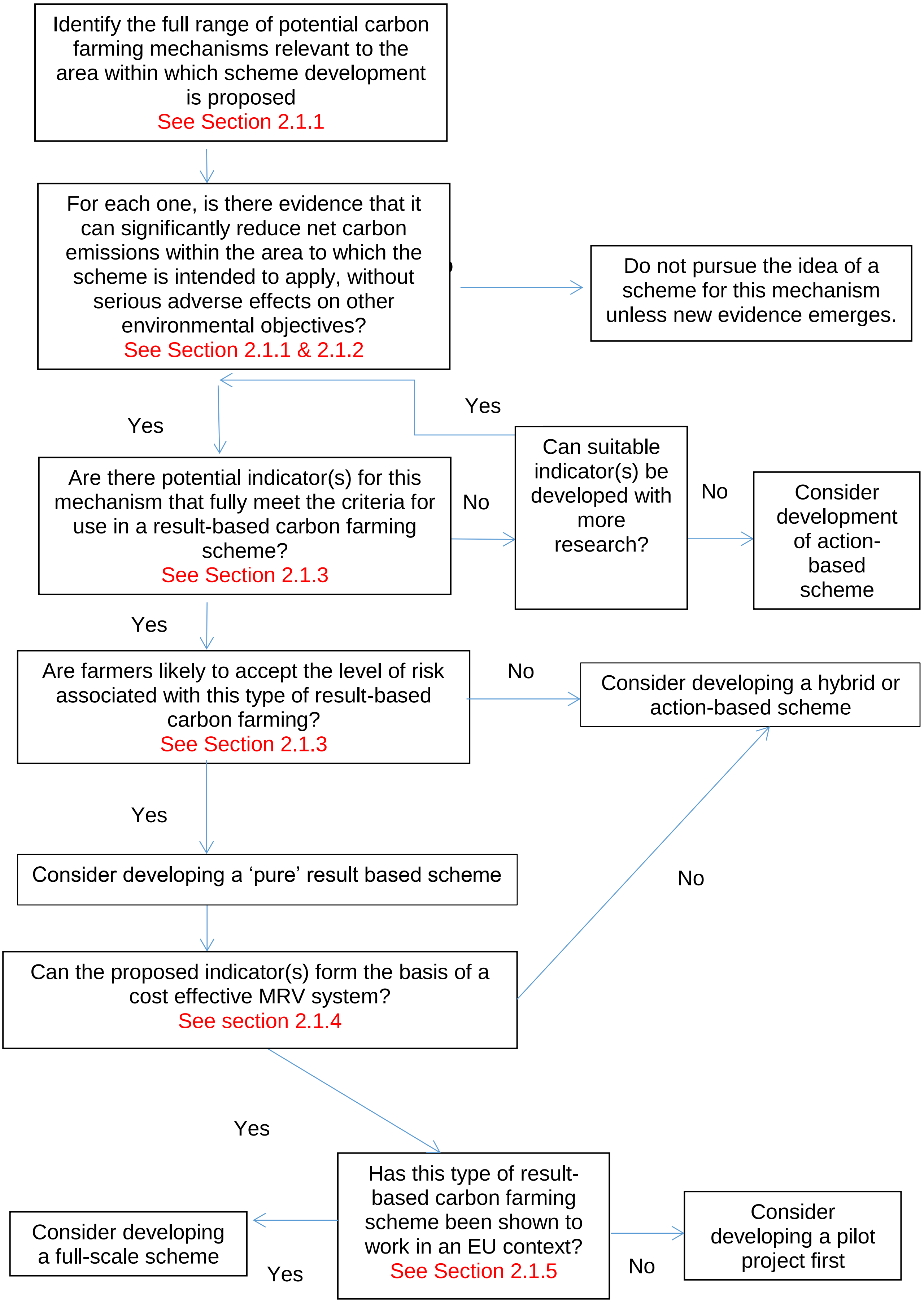


Fig.2. Confirming feasibility, setting up the governance and planning mechanism development

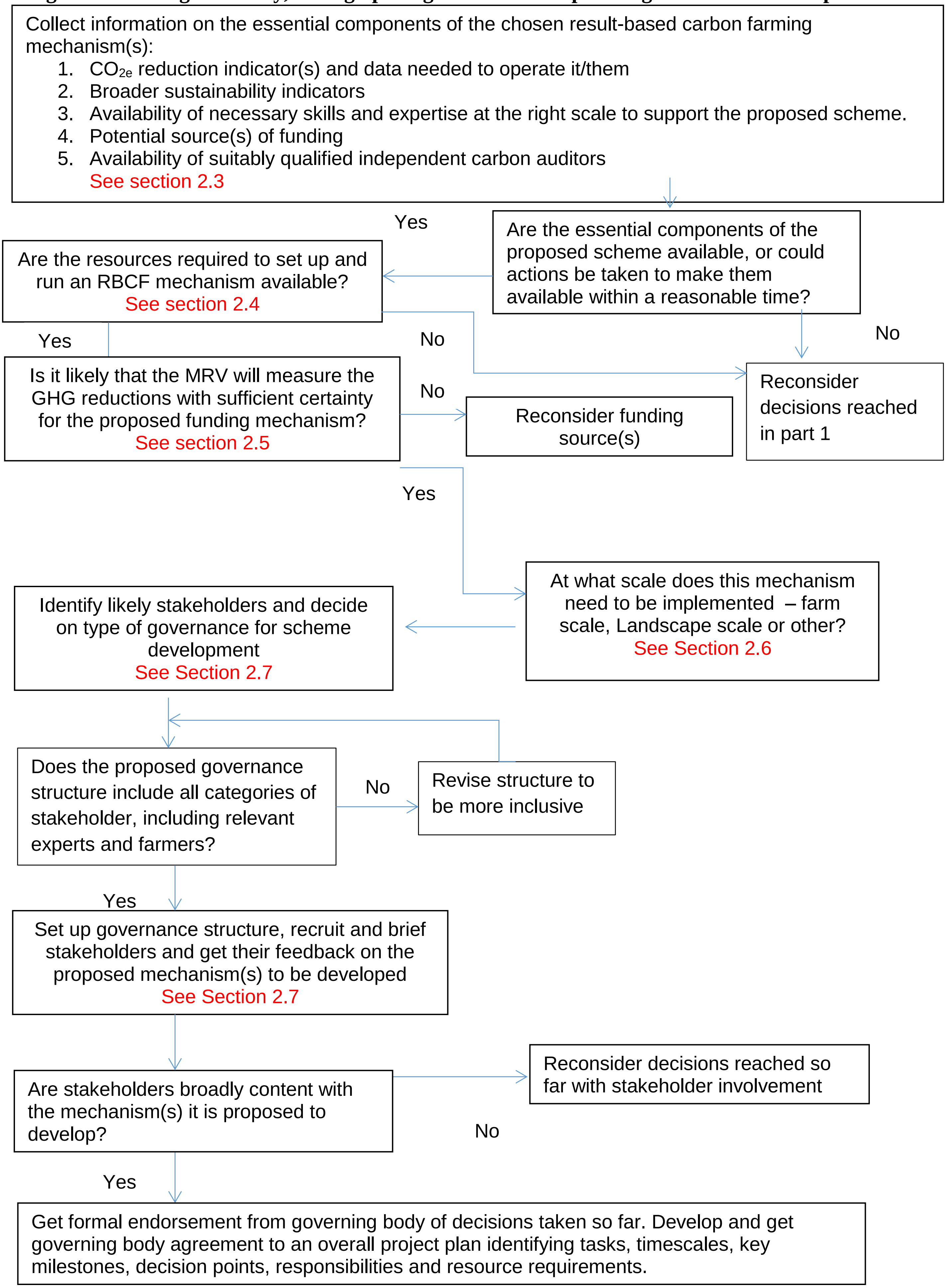
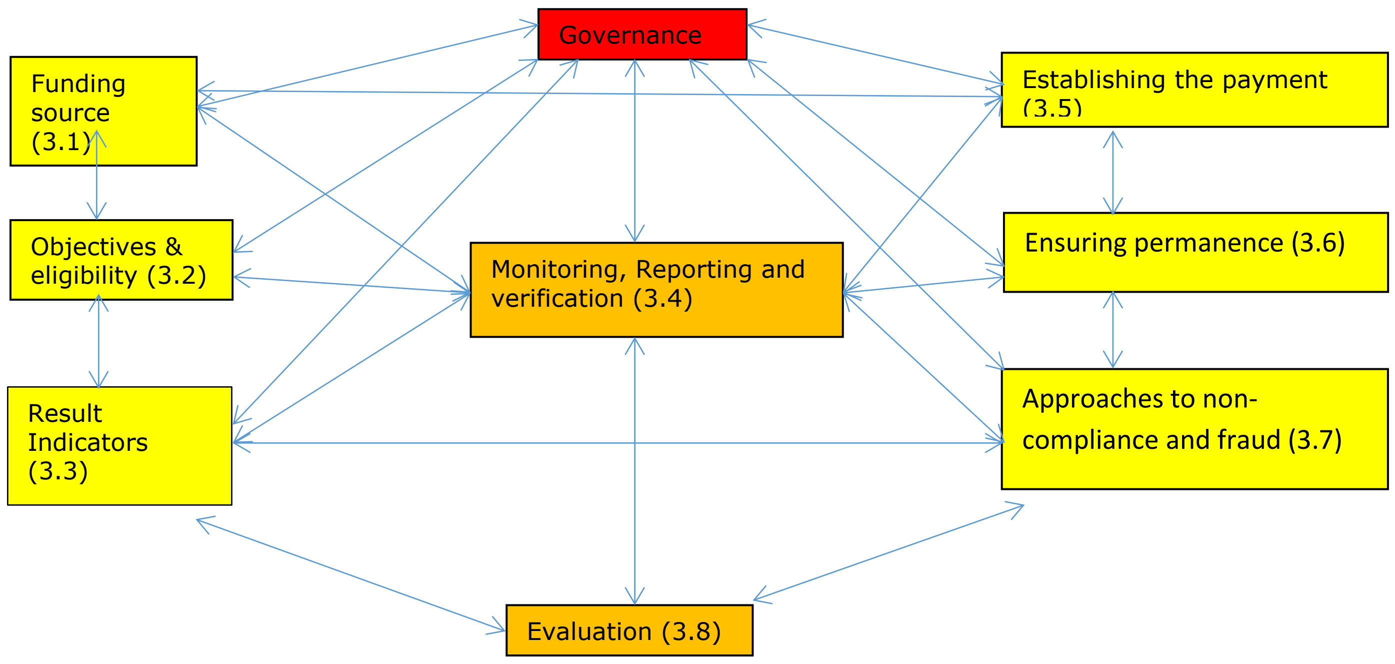


Fig. 3 Development process for a result-based carbon farming mechanism



Speakers‘ short biographies

Peter Baader is a lawyer by training and was a judge in Germany before joining the European Commission in early 1998. Mr. Baader has worked in different Directorates General of the Commission: Research, Information Society, Anti-fraud and, since mid-2011, Agriculture, almost always in contract and financial management and compliance. He is now a Senior Expert for compliance in DG AGRI’s resource directorate and is also active in communication.

Artur Runge-Metzger is the Director “Climate strategy, governance, emissions from non-trading sectors”, DG Climate Action, European Commission. He took up his current position in January 2016 covering

i. developing domestic and international climate strategies,
ii. overseeing the governance of EU climate action,
iii. regulating greenhouse gas emissions from non-ETS sectors including buildings, road transport including decarbonising fuels, land use, land use change and forestry, waste, carbon capture, use and storage as well as
iv. supporting innovation and modernisation in the EU's energy and industrial sectors, e.g. setting up the Innovation and Modernisation Fund.

Before, for twelve years he led on climate strategy and international climate negotiations including the adoption of the Paris Agreement in 2015. Until mid-2003, he occupied various Commission assignments in Sarajevo, Brussels and Harare. He holds a doctoral degree in agricultural economics from the University of Gottingen.

Dr. Andreas Täuber is an agronomist by education and has a PHD in agricultural law. Andreas has more than 25 years of experience in sustainable agriculture and green growth as well as climate protection, from both long-term implementation experience in Russia and the Caribbean as well as in the Federal Minstry of Food and Agriculture of Germany responsible fort the national climate policy in the sectors of agriculture and LULUCF. Andreas is deputy head of division for sustainabilty and climate mitigation/-adaptation.

Helle Qwist-Hoffmann is an agronomist by education and has an MBA in Leadership & Sustainability. Helle has more than 25 years of experience in sustainable development and green growth, from both short-term consulting and long-term implementation experience from field, regional and headquarter levels of the UN system, international financing institutions, bilateral agencies and consulting firms. Helle recently joined COWI as the Head of Section of Environment & Sustainability.

Ivo Degn is the Co-Lead and initiator of the Farm-Food-Climate Challenge from Project Together, a broad alliance of players from the agrifood sector in Germany. The Farm-Food-Climate Challenge supports and coordinates over 100 initiatives and start-ups in testing innovative approaches to a climate-positive agrifood sector, from reducing and reusing food waste to carbon farming approaches. By combining a rapid prototyping approach with systemic thinking, ProjectTogether combines bottom-up and top-down in developing new policies for future-oriented agriculture. Ivo's special interest and focus is on carbon farming approaches, transition finance and remote-sensing technology.

Dr. Konstantinos Makris is an associate professor of environmental health in the Cyprus International Institute for Environmental and Public Health within the School of Health Sciences at the Cyprus University of Technology. He has held an appointment as adjunct assistant professor of environmental health at Harvard University, USA (2009-2015). Dr. Makris leads the exposome-based water and health lab which aims to minimize the human health risk associated with chronic exposures to environmental stressors. For the past 8 years, his team investigates the effectiveness of organic food-based interventions at schools in improving children’s development and health.

Dr. Martin Voss is an agronomist by education and PhD plant pathologist, has 25 years of experience in reduced tillage and other regenerative farming practices as well as conventional and biological plant protection in Europe and North America. Most recently, Martin has joined Indigo Agriculture Europe GmbH as the Head of R&D for Indigo’s microbial seed treatment products and all technical aspects of Indigo Carbon. Indigo’s mission is to harness nature nature to help farmers sustainably feed the planet.

Professor Jim McAdam OBE started the agroforestry research programme at the Agri-Food and Biosciences Institute, Northern Ireland in 1989. He was head of the Grassland and Plant Science branch in AFBI until retirement in 2018, is a past-Chairman of the Farm Woodland Forum and has participated in a number of national and EU agroforestry-based programmes. His research interests revolve around the potential for silvopasture to help farmers move towards a carbon-neutral livestock industry in a climate-challenged environment. He is currently an Honorary Professor in Queen’s University Belfast and is involved in promoting agroforestry on the island of Ireland through the Irish Agroforestry Forum.

Clunie Keenleyside is a Senior Fellow within IEEP’s Agriculture and Land Management programme, specialising in agricultural and rural development policy and in particular the CAP. She has extensive experience of working on policy analysis at EU-28 level, including the DG Climate Action study of effective tools for climate action in agriculture and forestry, and DG Environment's Updated Inventory and Assessment of Soil Protection. For the past five years Clunie has been at the forefront of developing policy and practice on result-based payment schemes, including the Commission's guidance document for managing authorities on implementing result-based payments for biodiversity, and pilot projects on farms in Romania, England, Spain and Navarra, funded by DG Environment.

Claire Chenu s research director at INRAE (French National Research Institute for Agriculture, Food and Environment) and consulting professor of soil science at AgroParisTech, working at the research unit ECOSYS in Paris area. Her research deals with soil organic carbon: dynamics, stabilization processes and the effect of cropping practices on soil C stocks. She is involved in the science-policy-practice interface and in awareness raising activities on soils. She is a member of the scientific and technical committee of the 4p1000 intiative on soils. She coordinates the EU H2020 European Joint Programme SOIL: "Towards climate-smart sustainable management of agricultural soils". She was the 2019 Soil Science medallist of the European Geosciences Union."

Rainer Baritz, Soil Expert, European Environment Agency (EEA). Rainer Baritz has an MSc in forest science and a PhD in ecology and soil science. He worked at various national and regional forest research stations in Germany, focusing on soil monitoring and soil indicators. At JRC Ispra, he worked on European land carbon pools, in particular forest soils. He supported the IPCC and the preparations of the European Soil Thematic Strategy as soil carbon expert. At the Federal Institute for Geosciences and Natural Resources in Germany, he became responsible for the national soil information system, before he was detached to FAO in Rome working on global soil information and indicator development. He joined EEA in 2017. His interests are European soil condition assessment; chemicals in soils; soils and climate change. Rainer Baritz is coordinator of the European National Reference Centres Soil, and currently chair of the European Soil Partnership.

Christine Müller is a Principal Administrator in the European Commission, DG CLIMA. She manages the Carbon Farming study contract and works on Carbon Farming from Pilot design to policy development.

Pierre Bascou is an agronomist by education and has a PHD in agricultural law. Andreas has more than 25 years of experience in sustainable agriculture and green growth as well as climatre protection, from both long-term implementation experience in Russia and the Caribbean as well as in the Federal Minstry of Food and Agriculture of Germany responsible fort he national climate policy in the sectors of agriculture and LULUCF. Andreas is deputy head of division for sustainabilty and climate mitigation/-adaptation.

Susanne Abel is a biologist and works for about 10 years for the Greifswald Mire Centre on peatland related topics. She build up the worldwide "Database of potential paludiculture plants" and worked since several years for capacity building and knowledge transfer for peatland and climate protection and the implementation of the sustainable use of peatlands in Germany.

Asger Strange Olesen is an Associate Technical Director at COWI, Denmark. He has more than 12 years of professional experience with LULUCF accounting, carbon farming and MRV systems, as well as an experienced project manager for European Commission contract and international clients. He serves as a member of the UNCFFF Roster of Experts for Review of National Communications and Biannual Reports and regularly presents and speaks on climate change mitigation in the land sector. With extensive knowledge on GHG mitigation, accounting and methodologies he served as Denmark's LULUCF expert for a couple of years later becoming a LULUCF, CAP and Bioeconomy desk officer at DG CLIMA. Mr Olesen is the project manager on the carbon farming project of today's roundtable.

Jens Leifeld is head of the Climate and Agriculture Group in Zurich at Agroscope, the Swiss center of excellence for agricultural research, and lecturer for soil science at Universität Basel, Switzerland. His research explores the role of agricultural soils as sources and sinks for CO2 under different management and land-use techniques. In recent years, an increasing number of projects have been dedicated to the functioning of managed organic soils and their GHG balance. In addition to conducting and supervising research, an important part of his work is to advise and support federal agencies with respect to climate-friendly soil management.

Christian Holzleitner is currently Head of Unit responsible for Finance for Innovation and Land Use at the European Commissions Directorate-General for Climate Action. Previously, he worked as assistant to the Director-General for Climate Action covering all issues related to EU and international climate policy; and at the Directorate-General for Competition in the area of State aid for services of general economic interest in the postal, transport, and health sectors. Before joining the European Commission, Christian worked as senior manager with KPMG Germany on international transfer pricing. Christian is an economist and holds a PhD from the University of Linz (Austria).