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Carbon Farming Schemes in Europe - Roundtable

Background document

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1. Introduction

The 2019 IPCC special report on Climate Change and Land[1] clearly states that meeting the goal of the Paris Agreement will not be possible without major changes in how our land resources are utilised.

The 2018 Commission Communication "A Clean Planet for All"[2] lays out an EU vision for transitioning to a climate neutral economy by 2050 - meaning Europe's net greenhouse gas emissions will be zero in that year. Such deep decarbonisation requires contributions from all sectors, and the Communication points to the central role that land management – including agriculture and forestry – will have to play in reaching climate neutrality. Agriculture and land management will need to significantly reduce emissions associated with production, and reverse the current trend of agricultural soil and other carbon stock loss on farmed land. Producing biomass to replace carbon-intensive materials is also key. This management of carbon pools in soils, vegetation and materials, and the flows and greenhouse gas (GHG) fluxes at farm-level, with the purpose of minimising climate change is referred to as carbon farming. Carbon farming has to be seen as an integral part of overall farm management, and be integrated within broader climate and agricultural policies (including National Energy and Climate Plans and Strategic Plans under the Common Agricultural Policy).

In 2017, the EU agricultural sectors' methane and nitrous oxide emissions amounted to around 439 million tons of CO2 equivalent, annual agricultural soil carbon and other agricultural carbon stock losses added another 75 million tons of CO2 equivalent emissions to the overall greenhouse gas release of the sector.[3] Consequently, agriculture was responsible for approximately 13% of total GHG emissions (including LULUCF) in the EU. Whilst the current non-CO2 emissions from the agricultural sector are still below 1990 levels, reductions have slowed over the past decade and since 2012 agricultural emissions in the EU have started to rise again, these facts providing the context for intense discussions around the role of agriculture and land resources for climate change mitigation.

How exactly landowners should be motivated to undertake climate-friendly actions is not prescribed in the Paris Agreement or in EU climate policy. This is up to the individual parties to the Paris Agreement, and in the European Union, the competence is shared between the EU institutions and its Member States. The existing EU legislation provides a framework for activities at Member State level, setting the overall ambition for climate change mitigation, and the need for agriculture and land management to contribute to this mitigation. From this, it is clear that agriculture and land management will need to step up ambition to deliver on climate policy objectives, and Member States will need to design and incentivise interventions to meet their climate targets while also considering their contributions to the bioeconomy, adaptation needs and broader delivery of ecosystem services.

Within this context, result-based carbon farming schemes have the potential to incentivise farmers to deliver on climate mitigation ambition. In doing so they would also be contributing to a more result-oriented and outcome-focused delivery of climate policies, making an explicit link between the use of public and private money and the resulting impact.

2. Carbon farming study

The aim of the carbon farming study[4] is to produce guidance for setting up and implementing result-based carbon farming schemes in EU Member States with reference to opportunities for support under a future CAP. This is intended to contribute to the delivering of emission reductions from the land using sector and to carbon sequestration. The guidance will include information on generic principles and worked examples as to how

[1] https://www.ipcc.ch/srccl-report-download-page/

[2] https://ec.europa.eu/clima/policies/strategies/2050_en

[3] Official EU UNFCCC GHG inventory submission 2019

[4] The study runs from November 2018 until November 2020, the terms of reference of the study „Analytical support for the operationalisation of an EU Carbon Farming Initiative" can be found under the following link: https://ec.europa.eu/clima/tenders/2018/243022_en

Member States could set up carbon farming schemes relevant to arable and livestock management, and land use conversion.

Adopting a result-based approach requires a direct and explicit link between the results delivered (e.g. GHG emissions avoided or CO2 sequestered) and the payments made to the land manager. This requires setting a detailed and context-specific objective (result) and measuring its achievement in a consistent way either directly or through reliable and tested proxy indicators (a result indicator). It is essential that results are within the control of the land manager and measureable (both spatially and temporally) in the scope of any agreement with the land manager. They should not be influenced by events/interventions on other land. Many of the existing carbon farming schemes (e.g. Australian Carbon Farming Initiative) use GHG emissions as a result indicator and provide payments for the delivery of climate mitigation benefits, quantified as CO2-e emissions avoided or CO2 sequestered. Based on experience arising from result-based biodiversity schemes, a result can also be defined as a measurable physical state/condition that can be shown to deliver climate mitigation benefits in that specific context (e.g. as per the calculation method of the Woodland Carbon Code). For example, following this approach, afforestation on degraded cropland would be considered a result, and payments would be made according to the quality of the afforested area (e.g. mix of species, soil health etc.) based on assumed emissions factors.

The different ways to define and assess the results have strengths and weaknesses and depending on the specific context one of them might be more appropriate to implement. Independent of the choice of approach, result-based schemes are seen as a means to more directly link the use of public or private funds (the payments) to the results that those funds are intended to deliver, without prescribing how to achieve the outcome. The scheme set up should ensure farmers have the knowledge, understanding and evidence base to support their decision-making around delivering results (for example, carbon farming schemes presented below all contain an advisory service element to guide farmers with practical information and support). This would better inform land managers about society's desired outcomes from activities on their farms whilst still providing them with choice in terms of how this is achieved.

3. The aim of the Roundtable

Drawing on an extensive analysis of existing carbon farming schemes globally and within Europe, the Roundtable offers an opportunity to discuss with stakeholders the most promising options for result-based carbon farming schemes in Europe. The Roundtable will bring together policy, scientific and legal experts with knowledge of assessments and implementation of climate mitigation actions in agriculture and carbon farming schemes in Europe. The day will be structured around options for carbon farming schemes related to arable and livestock farming, and land conversion. In addition, mechanisms for scaling up and governance of carbon farming schemes will be discussed. The challenges and solutions for the design of carbon farming schemes will be illustrated and explored with examples from existing schemes. These projects will present lessons that they have learnt from their work, and the implications of these for future development of carbon farming schemes.

The overall aim of the Roundtable is to inform the further exploration of carbon farming scheme options in Europe. This will take place through thematic case studies conducted within the frame of the Carbon Farming study between autumn 2019 and spring 2020. Ultimately, this work will result in guidance on operationalising result-based carbon farming schemes with the aim of facilitating their widespread uptake in Europe.

4. EU result-based carbon farming examples: classification of existing schemes

A number of pioneer initiatives within Europe have developed or started to develop payment schemes addressing GHG emissions/removals in agriculture. These initiatives can provide ideas and lessons learned for the future development of result-based payment carbon farming schemes. The focus and scope of these projects ranges in terms of the degree to which they consider and provide reward / payments for results. At the same time, these projects / initiatives also range in terms of the components of the farming systems that are included. Specifically:

- Some projects are purely informational / awareness-raising schemes, where farmers are informed, yet not required to implement practices (carbon tool approaches such as Cap2ER, or Cool Farm Tool when these are not tied to payments for management or results).
- Under the Common Agricultural Policy, many measures including agri-environment-climate measure support farmers to change their management by providing compensation for additional costs and income foregone due to changes in management. Farmers are not paid for verified improvements against a specified result indicator, but rather encouraged and/ or rewarded for management-focused changes. In some of these schemes, attempts have been made to capture the mitigation effects in a more qualitative way, however, without a clear methodology for monitoring, verification, and reporting.
- Several projects funded under the LIFE+ funding instrument, as well as under the EIP Agriculture, develop elements and methods relevant for result-based carbon farming schemes (e.g. OLIVE4CLIMATE, AGRESTIC projects)
- Some projects in the EU have also been developed for the voluntary carbon market, where farmers receive carbon credits equivalent to their mitigation impact in accordance with an approved methodology, which private actors and business wishing to reduce their climate footprint can purchase (e.g. MoorFutures, UK Woodland Carbon Code; Carbon AGRI).
- Finally, there are also existing initiatives or initiatives in pipeline developed by retailers or agri-food companies as part of their supply-chain management, whereby farmers in their supply chains are rewarded for changes that contribute to improved climate outcomes (e.g. SPAR/WWF Healthy Soils for Healthy Food project). Going even one step further, there are initiatives pulling desired carbon farming food products and ingredients through (often shorter than usual) supply chains to meet sustainable, often organic food demand (e.g. cities of Copenhagen, Milan) for healthier eating (LIFE Organiko[5] project).

At the Roundtable, four schemes will report on their lessons learned: Label Bas Carbone – AGRI CARBON, SPAR/WWF Healthy Soils for Healthy Food, UK Woodland Carbon Code, and MoorFutures. An illustration of where these schemes fit along the result-based dimension and which aspects of farming systems they cover is given in the graphic below. *Annex I* gives a brief description of these four schemes.

[5] http://organikolife.com/en/

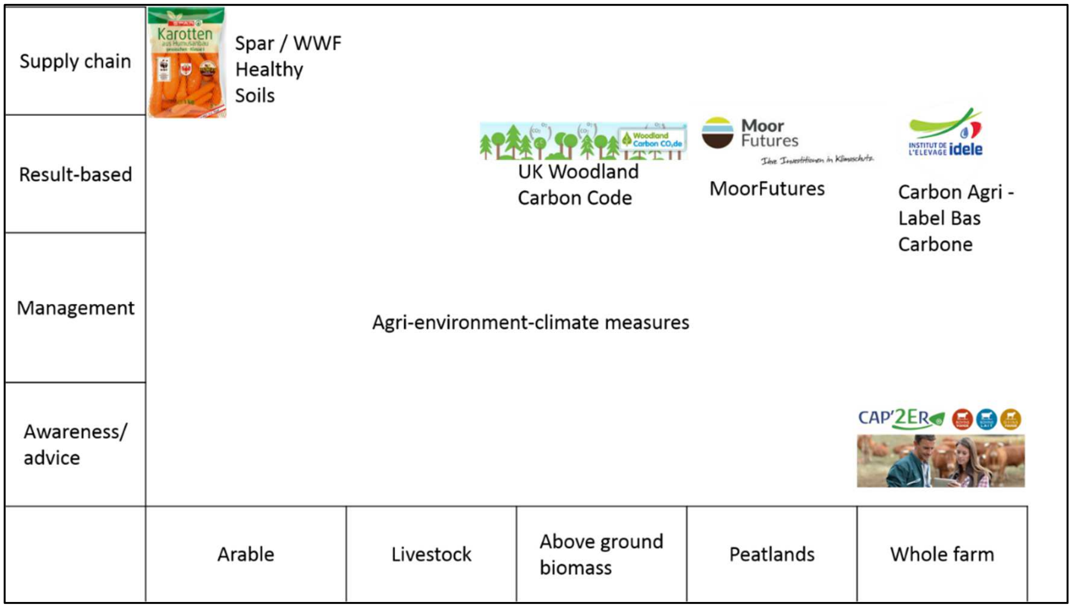

Fig 1. Illustrative examples of existing result-based carbon farming schemes in Europe

5. Guidance for the development of result- based carbon farming schemes in the EU

To develop effective guidance for scaling up carbon farming schemes in Europe, it is necessary to explore options and draw conclusions on design elements that are fundamental to the delivery of effective results-based carbon farming schemes. Examples of the main choices that need to be made are outlined in the box below. It is also important to reflect on different enabling mechanisms to scale up carbon farming schemes.

Design elements for carbon farming schemes – examples of choices to be made

- Governance
    - What entity owns / operates the scheme?
    - What are the operational structures and responsibilities?
    - What type of independent supervision / audits are in place?
    - What types of advisory services are provided to support farmers?
    - How does the scheme link with national GHG inventories and LULUCF accounting?
- Coverage and eligibility
    - What GHG stocks and fluxes, geographies, farming systems are covered?
    - Who can participate in the scheme?
    - What activities are eligible?
    - What eligibility criteria should be applied?
    - What result indicator will be applied, how will this be defined and how does this link to GHG emission reduction?
    - What are the risks associated with the definition of the coverage boundaries and where do these lie i.e. for other environmental knock on consequences, risks of failure, risks of unexpected responses?
- Baseline and additionality
    - What is the baseline against which additionality is measured?
    - How is additionality ensured?
    - What is counted towards additionality: total emissions reductions and/or emissions intensity, and/or CO_2 sequestration?

- Monitoring, reporting and verification mechanisms
  - How is change against the results indicator to be monitored? i.e. based on measurements (of what) or modelling / using default factors? Or both?
  - What are the reporting and record-keeping obligations?
  - Is an external audit conducted? And what should this check?
  - Who is validating and evaluating overall scheme integrity?
- Reward mechanism
  - How is the reward calculated and related back to levels of achievement based on the reward indicator? Are co-benefits rewarded?
  - Is the reward in the form of a monetary payment, or property title (i.e. carbon credit)? How are reward payments calculated e.g. GHG emissions avoided, effort required to deliver change, …?
  - When is the payment awarded?
- Transparency & reporting
  - What information is publicly available?
  - How are payment rates and resulting outcomes communicated to those within the scheme and external to it?
  - What mechanisms for information sharing and transparency are in place?
  - What analysis of scheme effectiveness and performance are kept and communicated to ensure ongoing learning/information to others developing similar approaches?
- Permanence, risk and flexibility mechanisms
  - How is permanence ensured? What buffers, insurance, or other mechanisms are set up to address natural disturbances?

It is also clear that a future guidance needs to consider the diversity of conditions in the EU, such as type of land use, existing land management, farming system and biophysical conditions (e.g. soil type) in order to ensure that the guidance and the approaches proposed are applicable to a wide array of circumstances. To facilitate the development of the guidance, the study team will conduct case studies, as mentioned above. Drawing on schemes and projects from outside the EU, existing initiatives within the EU, as well as knowledge of mitigation potentials and available climate actions, we have identified four potential options for result-based carbon farming schemes:

1. Whole farm audit
2. Peatland rewetting
3. Afforestation / Agroforestry
4. SOC sequestration on mineral soils

Annex II presents two-page summaries of each of these potential scheme options. These options can provide a basis around which to organise case studies and further exchange with stakeholders. The options draw on existing projects/schemes, whilst also extending and combining different elements and suggesting possible choices.

6. Questions for discussion at the Roundtable

Some key questions that the study team would like to reflect on with participants at the Roundtable are:

- Do the proposed options for carbon farming schemes cover the major opportunities for carbon farming in the EU? Are any key activities / emission sources / opportunities missing? If yes, which and why?
- Which result-based schemes do you think have the most potential? Why?

- What do you consider as the main advantages and limitations of result-based carbon farming schemes?
- Where do you see critical points for the development of result-based schemes in relation to baseline, additionality, or MRV?
- What pragmatic choices can we accept to keep the cost of MRV low to reduce this as a barrier to uptake (pragmatic yet still robust vs perfect)?
- We propose that "result-based" can mean delivery of a results indicator (i.e. linked to the ultimate goal of emission reduction but rather than directly measuring GHG mitigation/sequestration, instead measuring a proxy indicator), with payment made based on delivery of that proxy indicator. Do you agree or disagree?
- How to manage permanence concerns of carbon storage?
- How would the administration of result-based carbon farming schemes fit within the future CAP framework?
- How could the permanence requirements and long timescales be reconciled with CAP programming cycles?

In addition to these general questions, the following are some scheme specific questions raised in the first phase of the carbon farming study:

- In relation to carbon audits:
    - Are farm carbon audit tools reliable for all farming areas within Europe?
    - Should reductions in absolute emissions or emissions intensity be rewarded?
- In relation to agroforestry, afforestation, peatland conversion:
    - What would be the eligibility criteria for land use conversion schemes (agroforestry, afforestation, peatland rewetting)? What types of safeguards are needed for land use conversion schemes?
    - How can agroforestry be progressed, given the relatively low sequestration per ha (but large potential cumulative EU impact)? What common proxy could be used as a result-based indicator, i.e. to ensure the link to GHG mitigation? (for example, potential result indicator for agroforestry is delivery of standard / pre-defined quality of wooded landscape feature or integrated agro forestry cropping system. The standard would be developed by the relevant managing authority or scheme based on scientific literature regard carbon benefits and opportunities and their land condition (similar to the Woodland Carbon Code approach). Would such a choice sufficiently lower the cost of MRV and effectively incentivise agroforestry?

Annex I: Description of existing European carbon farming schemes

French Label Bas Carbone – CARBON AGRI

Intro/context The French *Label Bas Carbone (*French Carbon Standard) is a framework for voluntary carbon reduction project that was adopted by the French Government in November 2018. It provides a transparent framework for guaranteeing the integrity of carbon reduction projects. Environmental integrity is ensured through the utilisation of standardised methodologies in line with the overarching rules set in the regulation. To date, it includes approved methodologies for forestry (afforestation, coppicing, and restoration) and for agriculture (CARBON AGRI). Companies, public organisations or individuals that wish to compensate their emissions can voluntarily acquire the emission reductions determined thanks to these methodologies to offset their emissions.

Individuals or sectors can propose methodologies, which the regulator must approve. These methodologies set guidelines for how to do the following: establish eligibility criteria, calculate baseline scenario and demonstrate additionality of the project, demonstrate environmental integrity (i.e. co-benefits), requirements on identifying and managing non-permanence risks, calculate emissions reductions relative to baseline, and MRV requirements and methods. The specific methodologies differ, but the general steps for implementing remain the same: Project developers register their project that applies an approved methodology and meets its quality requirements; they then request the *Label Bas Carbone* approval by submitting project description and required documents/evidence. The regulator reviews and asks any clarifying questions/requests additional evidence and denies the project or approves it for recording in the register. Only projects that are additional will be approved (i.e. the carbon credits would shift the Net Present Value of the project from negative to positive and the project would not otherwise occur without credits).

To date French government has approved methodologies for afforestation, coppicing, forest restoration and one in agriculture named CARBON AGRI. Here, we introduce CARBON AGRI the methodology for monitoring emission reductions in cattle and crops productions in compliance with the Label Bas Carbone.

Overview: CARBON AGRI provides a method for project developers (i.e. person/organisation/company) to account for emissions reductions on cattle (beef and dairy) or field crop farms in France thanks to actions that mitigate GHG or increase carbon storage. These validated emissions reductions can then be traded for payment from an external party voluntarily offsetting their emissions. The method includes six types of actions: herd management and feeding, animal manure management, crop & grassland management, consumption of fertilisers and energy, and carbon storage (in total 40 low carbon practices). It quantifies both reductions on farm as well as associated upstream emissions, applying life cycle assessment. Emissions change is calculated using the national tool CAP2'ER®, a whole farm calculator. Change in emissions is calculated based on change in emissions intensity (i.e. kg GHG per kg of output). Each project runs for 5 years and can be renewed.

MRV: CARBON AGRI allows farms to calculate their baseline either using a conservative generic reference (using default inputs values coming from CAP'2ER® national database) or a more accurate specific reference per farm calculated with CAP'2ER® level 2 which requires approx. 150 activity data. To account for higher uncertainty of using generic reference, reductions are discounted by 10%. Following the initial project development and validation, the farm can also do a simple assessment (CAP'2ER® level 1) to track expected progress at some point in the first 5 years (this is optional). Then at the end of the 5 years period, a final accurate level 2 run of CAP2'ER® is required to calculate new carbon intensities and with CARBON AGRI to determine the net emissions gains relative to the baseline.

Reward mechanism: The Label bas Carbone is result-based, that is project developers receive 1 "credit" (recognised reduction that can be sold to voluntary financers) per t CO_2 sequestered/avoided. The reward is paid at the end of the 5-year project period, upon verification (i.e. ex post).

Permanence/risk mechanisms: As most GHG reductions associated with CARBON AGRI are avoided emissions, there is low non-permanence risk. For farms that sequester carbon in biomass or soil (where non-permanence risk exists), a 20% discount is applied to their payments.

More info: https://www.ecologique-solidaire.gouv.fr/label-bas-carbone, http://idele.fr/reseaux-et-partenariats/bouvinnov/publication/idelesolr/recommends/carbon-agri.html

Healthy Soils for Healthy Food

Intro/context: Healthy Soils for Healthy Food is a producer-retailer-consumer initiative led by the Austrian supermarket chain SPAR with support from WWF Austria focussed on GHG sequestration through soil carbon on agricultural land. Since its beginning in 2015, SPAR and WWF have worked with approximately 60 farmers to build up soil carbon in their horticultural land (covering 1052 ha). While not exclusively results-based, farmers were initially rewarded per tonne of carbon stored on their land through soil carbon actions, though this is now being shifted to activity-based payment.

Overview: The project offers support/training to farmers, expert sampling and MRV of soil carbon, and rewards for participation. Activities covered by the project relate to management of Austrian soils and entail fertilisation with compost; reduced tillage; cover crops; and crop rotation and intercropping. The programme does not monitor the activities that farmers implement, but merely gives them recommendations. An independent certified specialist body samples and analyses soil for monitoring purposes.

MRV: The project uses soil sampling to measure the climate impacts. Soil sampling is done prior to project start and after 2-3 years (max. 5 years) after joining the initiative. Per 5ha block, external certified experts take and evaluate 25 soil samples. Farmer activities are not monitored; only the impact on soil carbon.

Reward: The project is partially results-based. Along with education and support, SPAR guarantees the sale of produced vegetables (on the basis of 3-year contracts). In addition, initially, farmers receive a bonus of EUR 30 per tonne of stored carbon (CO_2e). However, following resistance from farmers, who would have to pay this back if soil carbon later decreased, the payment system has changed to be activities based, where they are paid a price increase per product unit based on the additional effort associated with soil friendly production.

Permanence/risk mechanisms: There are currently no mechanisms in place to mitigate risk of long-term reversal, apart from the education and support provided, and the incentive to stay in the scheme.

More info: https://www.wwf.at/de/spar-boden-und-klimaschutz/

UK Woodland Carbon Code

Intro/context: The UK Woodland Carbon Code incentivises UK woodland planting for carbon sequestration through a voluntary standard. The Code sets out how to plant and manage woodlands, and how to robustly measure, report, verify and govern the resulting sequestration. As a reward, landowners receive voluntary emissions credits that can then be sold through the Woodland Carbon Code Registry to companies/private individuals to offset their emissions. Since its launch in 2011, 187 projects covering 8,261ha have been validated, with expected carbon sequestration of 3.4million tC02. Scottish Forestry, along with the other forestry authorities in the UK, governs the project, with support from an expert advisory group.

Overview: The Woodland Carbon Code sets out a step-by-step process with guidelines for planning and planting woodlands, registering and validating your project, verifying expected sequestration, receiving and selling carbon credits, and ongoing monitoring, verification, and verification (MRV). Any UK land previously not forested (i.e. for the last 25 years) and not deep peatland is eligible, subject to normal planning and environmental constraints. Projects first register on the UK Woodland Carbon Code Registry, either individually or as a combined group of projects. They project must submit a project design document in accordance with the guidance (and necessary evidence). This sets out a baseline (i.e. carbon stock without woodland planting) and the planned woodland planting and management (and quantifies expected project carbon sequestration), as well as carbon leakage. All of this is used to calculate the expected net sequestration (in terms of tCO2 sequestered). The Project Design Document also sets out all administrative information, MRV plans, etc. An accredited independent body then assesses and validates this Project Design Document, after which the project can be implemented. Upon validation, projects receive Pending Issuance Units, which they can sell to buyers or retain to sell at a later date. Regulators convert these into Woodland Carbon Units upon verification.

Small projects (<5ha) can apply optional streamlined validation and verification processes.

MRV: Expected carbon sequestration (and baseline storage) are calculated using a WCC Carbon Look-up Tables and a Calculation Spreadsheet. This calculates expected sequestration based on factors including timing of planting, species, woodland management, soil type etc. Landowners' project plans must be validated ex ante and then verified ex post at least at year 5 and then every ten years. Monitoring at year five includes a visit by the external verifier and verifies that the woodland has been successfully established in line with the project plan (including density, species mix, tree health/protection). Monitoring at subsequent 10 year intervals will assess actual carbon sequestration and tree growth rates (included sampling measurements of tree density etc.).

Reward mechanism: The Woodland Carbon Code is results-based i.e. landowners receive 1 voluntary carbon credits for each t of sequestered carbon, which can then be sold to buyers as voluntary offsets for their emissions. Landowners will receive credits ex ante in the form of Pending Issuance Units, which they can sell to buyers, or they can sell the credits once verified at a later date. As the expected sequestration is verified, the registry will convert these into verified Woodland Carbon Units, which the buyer can then use to offset their own emissions.

Permanence/risk mechanisms: To minimise risks of impermanence, landowners must identify and mitigate risks. They are required to restock if wood is harvested and replant if woodland is lost (e.g. through fire, pest, wind etc.). They are also contractually obliged to manage in accordance with their project plan, as are subsequent landowners. Initial carbon sequestration estimates are reduced by 20% to cover any modelling errors. In addition, all projects must contribute a further 20% of credits to the Woodland Carbon Code shared buffer. These cover any losses of verified credits over the project duration (which if drawn down must be replenished e.g. through replanting) and are then retired at the end of project life.

More info: https://www.woodlandcarboncode.org.uk/uk-woodland-carbon-registry

MoorFutures

Intro/context: MoorFutures is a results-based voluntary scheme to incentivise the rewetting of peatlands to decrease GHG emissions. Projects are rewarded in the form of voluntary carbon credits for the decrease in GHG fluxes that arises from rewetting. The MoorFutures scheme is based in three states in Germany and has been selling voluntary carbon credits from peat rewetting since 2010 (the five existing or completed projects have expected lifetime GHG flux reductions of 68889t/CO2-e).

Overview: With the support of consultants, projects develop a forward-looking project baseline and project plan. The baseline identifies the expected land use that would occur without the project, and quantifies the expected associated GHG fluxes (i.e. sequestration – emissions) that would occur over the lifetime of the project (minimum 30-100 years). A project plan is then developed, which sets out how the project area will be managed for the life of the project (i.e. under rewetting, retirement of land), as well as MRV requirements, and quantifies the expected GHG fluxes under rewetting. The impact of the rewetting is calculated as the difference in GHG fluxes (i.e. t CO2-e) between the baseline and project plans, making conservative assumptions.

MRV: GHG fluxes are calculated ex ante. Primarily, an observational method (GEST) is applied, where the calculation of expected GHG fluxes is based on different observable land characteristics (e.g. peat type, climatic conditions, site characteristics, vegetation, land use/land cover), which are then associated with emissions factors. This is supported by an initial site visit to support calculations. Ongoing MRV plans are set out in the project plan. At a minimum they include external monitoring every 5-10 years to ensure project plan is being followed and at least one recalculation of the estimated emissions. External third-parties carry out this verification.

MoorFutures 2.0 also proposes methodologies for monitoring and reporting impact on other ecosystem services (e.g. water quality, flood prevention, groundwater enrichment, evaporative cooling, biodiversity), either through observatory methods equivalent to GEST or modelling.

Reward mechanism: MoorFutures is results-based i.e. the actual climate impact determines the reward. For each t CO2-e reduced, projects receive one voluntary carbon market certificate. Private companies/households purchase these as voluntary offsets. Certificate prices are based on the costs of their production, i.e. calculated by dividing the costs of implementation by the total amount of emission reductions over the project crediting period (EUR per t CO_2e); existing projects are selling certificates for prices of €35-80/t-CO2-e. Projects receive these credits ex ante upon project verification.

Permanence/risk mechanisms: To decrease risk of projects reversing (and releasing all carbon sequestered through rewetting), MoorFutures requires minimum project lengths of 30 years and requires that they set out how permanence will be ensured (e.g. through legal contracts, change of title etc.). In addition, MoorFutures includes a "buffer" to ensure that rewards are at minimum matched by GHG impact, even considering uncertainty: Projects are rewarded for the difference between project scenario (which is conservatively estimated, i.e. highest likely emissions) and the baseline scenario (which is also conservatively estimate, i.e. lowest likely emissions). This creates a buffer equivalent to the difference between the conservative and (less conservative but more likely) expected emissions. In addition, MoorFutures retains 30% of generated credits in a buffer reserve to cover risks.

More info: https://www.moorfutures.de/

Annex II: Carbon farming scheme options

Scheme option 1: Whole farm audit

Background

- **Potential impact of reducing livestock farm emissions:** In 2015, the agricultural sector was responsible for approximately 10% of Europe's GHG emissions. Numerous climate actions have been identified that can reduce agricultural GHG emissions through on-farm management, including herd management and feeding, animal waste management, crop management, consumption of fertiliser and energy, and carbon storage actions, among others.
- **Projects for rewarding reductions in livestock emissions already exist:** for example, within the EU, the French CARBON AGRI methodology is in the process of approval. The CARBON AGRI project uses the CAP2'ER farm carbon audit tool. With the help of consultants, farmers apply this tool to identify actions to avoid GHG emissions or increase carbon storage (relative to a baseline), which when implemented, are verified and can be sold as voluntary GHG reductions. Reductions are measured in terms of carbon intensity per unit of output. International examples are generally project-based that reward farmers/projects who apply specific pre-approved methodologies e.g. the Australian Carbon Farming Initiative's Beef Cattle Herd Management methodology or numerous VCS projects. Projects and regulations managing agricultural nutrient pollution (e.g. New Zealand's Taupo Nutrient Trading Scheme, numerous USA examples) also offer models for monitoring and governing dispersed agricultural pollution.
- **Key challenges for the scheme** include: 1) the development of reliable farm audit tools that cover the range of biophysical conditions and farming systems; 2) establishing cost-effective MRV across different geographies/contexts; 3) Identifying "fair" baselines upon which to reward additional reductions.

Proposed Approach

This scheme proposes decreasing GHG emissions through a whole farm audit for livestock farms, targeting livestock dairy and beef producers with intensively managed cropland and grassland. The scheme is voluntary. A farm carbon audit tool is applied to estimate the GHG emissions, and to identify management options to reduce GHG and sequester C on the farm. A management plan is prepared with an independent consultant that outlines which management practices / measures should be priorities. The farmer freely choses to apply the management options relevant and feasible to them. The requirement is that the audit is repeated after 3 – 5 – 7 years to monitor the changes. Tools such as (CAP'2ER, Cool Farm Tool) calculate emissions based on the whole farm system, capturing climate actions including feed efficiency, herd management, manure management, and sequestration. The farm unit-based scheme could have different levels of ambition:

- *OPTION 1* - Purely informational / non-result based farm-advice scheme focusing on awareness raising, without requirements for particular management options to be implemented and without requirements for a particular result to be achieved in terms of % or total amount of emission reductions / or sequestration achieved. Farmers are rewarded to cover their (and the advisor's) time.
- *OPTION 2* - Management-based scheme. Following the audit (i.e. *OPTION 1*), the farmer is required to implement a minimum number of management practices, or those practices which show the most potential for mitigation. Farmers are compensated to cover the additional costs for the management practices. The payment level depends on the number of management options that are chosen and applied (i.e. is activity not results-based).
- *OPTION 3* – Hybrid scheme – Farmers are compensated for the actions taken, but also receive an additional payment per tonne of CO_2-e emissions reduced.
- *OPTION 4* - Result-based scheme: farmers are rewarded equivalent to the difference in emissions between baseline and after actions taken. Note that this is likely still to be a calculation based on effort/compensation but differently structured i.e. expected effort to reach a certain threshold.

Governance: The scheme could be managed within CAP. The Managing Authority administers the scheme, approves the carbon audit tool, and regulates farm consultants and the conditions and reporting for their audit. Independent approved consultants carry out audits (with participation of farmers). To the extent possible, all administrative activities would be aligned with CAP, to minimise additional burden for participants and administrators.

Reward: *OPTION 1 and OPTION 2* could be easily rewarded through CAP (i.e. farmer is paid for activities). For *OPTION 3,* some payment could be made through CAP. The results-based portion of *OPTION 3* and the full payment for *OPTION 4* could be paid at a set rate of t/CO_2-e. To simplify payments, this could be made annually (i.e. a payment equivalent to expected annual emissions reductions), potentially as part of the CAP. If expected reductions failed to materialise, the farmer would face lower future payments to balance this. Alternatively, these results-based payments could be paid through a separate system either at a set rate (€) per t/CO_2-e or in the form of voluntary carbon credits. These payments would be made upon verification of carbon reductions (i.e. after MRV). Additional payments could be made to incentivise actions with high co-benefits.

Baseline and additionality: To ensure additionality, farms should only be rewarded when their actions reduce their emissions (or emissions intensity) below a baseline. To ensure differing degrees of additionality, this baseline could be set:

- at individual farm level, based on historic data (*e.g. CARBON AGRI)*. This should be based on an average of multiple years.
- at an average of “similar” farms (i.e. based on sector, region, size) (e.g. *LIFE Carbon Diary)*
- considering trends (i.e. if intensity has been falling for the last twenty years, this should be assumed under baseline)

To ensure additionality, regulators could only reward farmers who implement financially additional actions (i.e. do not reward actions that a rational farmer would already carry out (i.e. NPV>0)) (*OPTION 2,3,4)*.

Monitoring, reporting and verification: MRV should include co-benefits/externalities (also produced by carbon farming tool), as well as GHG impacts.

- *(For OPTION 1 and OPTION 2)*: simple activities based MRV, in line with CAP reporting.
- *(For OPTION 3 and OPTION 4)*: after ex ante baseline and plan development, MRV would occur every couple of years. This would consist of an independent rerunning the farm carbon audit tool. In between, farmers would have to record and report data to demonstrate that they are operating in line with the climate action plan (e.g. stocking rates, animal numbers and types, feed, manure management and timing etc.). This would be auditable, to ensure compliance. To increase accuracy, large farms or farms claiming large GHG emissions reductions could be required to submit to stricter MRV (e.g. also on-site visits, soil carbon tests, more regular audits), which could also be rewarded or incentivised by higher default emissions factors to reflect greater certainty of reductions.

All GHG impacts are measured using farm carbon audit tool approved for the region and sector (e.g. Solagro, CAP2ER, Cool Farm Tool).

Permanence mechanisms: For avoided emissions (e.g. reduction of livestock, nitrogen emissions, farm operations), there are no permanence risks. However, for carbon storage (e.g. through afforestation/agroforestry/soil carbon), reversibility concerns exist. Options to manage this risk:

- Only pay farmers for avoided emissions.
- Pay actions that sequester carbon separately, with requirements for long-term project plans and farmer liability for reversal.

Risk management: In addition, to manage reversibility, for *OPTION 3* and *OPTION* 4, the regulator should reward farmers less than the expected value of their carbon reductions. The balance (e.g. 20%) should be stored in a buffer account to provide cover for unintentional reversals (e.g. forest fire, drought).

Scheme option 2: Peatland rewetting

Background

- **Potential impact of peatland rewetting:** Peat soils are rich repositories of carbon – while they cover only 3% of the world's surface, they hold 30% of the world's soil carbon, which is twice that stored in all of the world's forests (IUCN, 2019). European peat lands have been steadily degraded through draining, erosion often fuelled by unsustainable agriculture and forestry, and fuel extraction (Peters and van Unger, 2017). Peat land covers 5.8% of Europe (Tanneberg et al., 2017). Protection and restoration of peat lands is seen as potentially cost-effective climate change mitigation strategy.
- **Existing results-based peatland rewetting schemes already exist**. For example, within the EU, LIFE projects on peat rewetting in the UK and Finland have progressed understanding and methodologies. The German MoorFutures project has been selling voluntary carbon credits from peat rewetting since 2010 (the five existing or completed projects have expected lifetime GHG flux reductions of 68889t/CO_2-e). Landowners can register peatland rewetting projects (with a life of 30-100 years), and then rewarded in voluntary carbon credits equivalent to the project's expected impact on GHG fluxes (i.e. relative to a baseline without the project). An updated version of the methodology also quantifies water quality, flood protection, groundwater, biodiversity, and evaporative cooling co-benefits, which can be bundled with the voluntary carbon credits, potentially boosting prices that buyers are willing to pay. The MoorFutures methodology builds on existing voluntary international examples, such as VCS.
- **Key challenges for peatland rewetting** include: 1) the long timescales (e.g. MoorFutures requires 30-100 plans), 2) the challenge of ensuring permanence; 3) establishing cost-effective MRV across different geographies/contexts.

Proposed Approach

The scheme incentivises peatland rewetting to decrease GHG emissions and increase carbon storage. The envisioned scheme is a voluntary project-based scheme (i.e. operates at project not farm unit scope). This incentivises the rewetting of peatland (and resulting retirement of managed land into non-intensive uses – see options below). With support from consultants, project managers develop ex-ante project plans that dictate how the project area will be managed over for a minimum of 30-100 years. The project plan includes a forward-looking scenarios that cover the lifetime of the project: a baseline scenario (i.e. what would happen without the rewetting project, capturing expected baseline land use emissions) and a conservative project scenario (i.e. what would happen if the project was applied, making conservative assumptions). Expected lifetime GHG fluxes are calculated for each scenario, and project managers receive credits equivalent to the difference (i.e. for the expected result of the project). The project plan also establishes MRV, which is carried out into the future to ensure project plans are followed and expected GHG fluxes are achieved.

Within this overarching approach, different restrictions on land retirement/conversion could be considered:

- *OPTION 1* Complete retirement/land use conversion (i.e. no more agricultural use, just peat, forest). This would require only simple MRV.
- *OPTION 2* Reduce emissions while continuing use (e.g. Paludiculture), mixed use or part of the farm in agricultural use. More complex MRV is required.

Governance: Administration, initial approval of project plans, and supervision of monitoring and evaluation is carried out by an independent central organisation with relevant expertise. To the extent possible, all administrative activities would be aligned with CAP, to minimise additional burden for participants and administrators, however, the difference between the scheme and CAP, e.g. project vs farm unit scope and differing timelines, could pose challenges.

Reward: Rewards are results-based i.e. they are equivalent to the expected lifetime reduction in GHG fluxes achieved by the project. Given the significant upfront costs, a significant proportion of total rewards should be paid up front, These costs could be covered under CAP pillar I. A credible commitment to covering the remaining rewards over the rest of the project lifetime (beyond CAP's seven year cycle) could be made in the form of co-payments by the member state, or through voluntary credit scheme. Additional payments could be paid for projects that deliver significant co-benefits. The reward could either be in the form of a voluntary carbon credit (whose price is set by the market), at a set level of €/t C02-e, or price could be set through a reverse auction (where pre-approved projects submit "bids" that reveal the amount of GHG reductions they can deliver at what price; the regulator would then accept and pay the best value projects).

Baseline and additionality: A forward-looking baseline scenario is set for the area covered by the project with support of a consultant. The baseline covers the length of the project (minimum 30-100 years). The baseline is based on past land use (evidenced by photos, CAP records etc.) and establishes expected GHG fluxes that would occur without the project (i.e. in absence of peatland rewetting). This includes emissions from land use (e.g. livestock farming), sequestration from trees, soil carbon storage. The baselines should be conservative i.e. assume low baseline emissions. Additionality is therefore ensured through baseline setting.
Financial additionality could also be required, such that only projects are approved when the carbon payments shift a project from uneconomic to economic (i.e. NPV shifts from <0 to >0).

Monitoring, reporting and verification: Timing of MRV: initial validation to occur before approval of rewetting project (i.e. of baseline and project plan). Then, MRV after five years, and then every ten years. MRV based around self-compliance, checked through reporting, and random and targeted audits backed by significant fines for failing to follow project plan/cheating/lack of MRV data. MRV should also cover broad sustainability indicators (e.g. biodiversity, water quality/quantity impacts). Two options for MRV:

1. Rely on a simplified observable method: base calculation of expected GHG fluxes on different observable land characteristics (i.e. obviating the need for site-specific measurements), with only very limited site visits and samples for baseline. For example, the MoorFutures project applies the GEST (Greenhouse Gas Emission Site Type) method, which provides a global warming potential value for different land types and soil moisture class and depth (see Joosten et al 2015), accompanied by reporting on land use and management. This method applies conservative estimates of GHG reductions.
2. Also as an "premium" option or as an alternative required monitoring approach, require more extensive monitoring and reporting (e.g. regular onsite visits, larger samples), but also greater accuracy and less conservative assumptions. Alternatively, this stricter monitoring could be obligatory for larger projects.

Reporting data must be sufficient to audit projects and ensure they are following their project plan. *OPTION 2*'s significantly greater variability and increased difficulty of monitoring require stricter MRV than *OPTION 1*.

Permanence mechanisms: To ensure permanence, project plans should cover a minimum of 30 years, and farmers made liable for reversals that are intentional or due to mismanagement (by requiring them to buy back equivalent credits or pay fines).

Risk management: To protect against reversal, for *OPTION 1*, land could be placed under a covenant or sold to a government/NGO. Alternatively, create a carbon credit reserve that withholds a portion of expected carbon reductions as a safeguard against losses/uncertainty:

- An implicit reserve can be created by using a conservative baseline scenario (i.e. rewarding projects less than their expected reductions)
- An explicit reserve can be made to cover specific risks (e.g. 20% buffer to cover peat fires), or non-specific risks (e.g. 5% reserve to cover uncertainty), or a shifting % dependent on risk factors.

Scheme option 3: Afforestation (and Agroforestry)

Background

- **Potential for afforestation sequestration:** The IPCC reports that afforestation could deliver 0.5–10.1 GtCO2yr-1 of sequestration. Depending on the areas reforested, the EU Commission reports that depending on where afforestation/reforestation occurred, planting of 350 million hectares by 2030 would deliver 1–3 Gt CO2e/year in Europe alone. Agroforestry also shows significant potential.
- **Existing results-based afforestation schemes already exist**. Within the EU, the Woodland Carbon Code offers a model of a voluntary offset scheme. Landowners can register afforestation projects that, after validation, then earn credits that can be sold to offsetting companies. To date, 266 projects covering 17,394ha have been registered, with expected carbon sequestration of 6.2million tC02.[6] International examples include voluntary schemes such as the California CARB Forest Offset scheme and New Zealand Permanent Forest Sink Initiative (PFSI), and the mandatory New Zealand Emissions Trading Scheme.
- **Key challenges for Afforestation** include: 1) the long timescales involved (e.g. NZ PFSI required participants to commit to 100 year covenants), 2) relatedly, the challenge of ensuring permanence; 3) interactions between forestry and other land uses (i.e. how to reward land use change from land uses that produce more carbon e.g. livestock farming). The same challenges exist for Agroforestry, which is complicated by **Agroforestry** offering smaller sequestration potential than afforestation per ha (and equivalently lower sequestration rewards) and more difficult MRV.

Approach

The scheme incentivises carbon sequestration in trees, shrubs, and bushes on CAP-regulated farms. Here, we focus on **Afforestation**, i.e. the complete retirement of low-productivity land from productive agricultural use (i.e. crop or animal production) to be planted into trees (Agroforestry is discussed at the end of the document). This scheme is voluntary and operates at the whole farm scale. It aims to be results based, i.e. farmers are paid for their actual carbon sequestration. Participants (i.e. farm units) are obliged to draft a project plan, including a baseline scenario, proposed afforestation plan (and expected GHG impact), summary of ongoing management activities for the afforestation, map of area to be planted, and Monitoring, Reporting, and Verification (MRV) plan. This can be done with the assistance of a consultant. This will be the basis for evaluation of the project plan, calculation of reward, and ongoing MRV. All farm types can participate but land must have been previously unforested and not consist of organic soils (e.g. peat), and planting must not cause significant negative externalities.

Within this approach, there are three overarching options with increasing regulatory complexity and ambition:

- Activity based / non-result based scheme promoting afforestation of previously productive or unused agricultural land. Advice provided to develop planting plan that will maximise carbon sequestration along with related EU goals including biodiversity, water quality/quantity, and resilience to climate change, among others. No requirement or payment for achieving a set level of carbon sequestration. Farmers receive a payment to compensate for the planning and planting costs. While this would not compensate farmers in a results-based manner, it could pay a premium above planning and planting costs to partially recognise the afforestation's positive impact on the climate. This can be combined with other measures funded under the CAP.
- 2. Results-based with low-cost MRV. Results-based scheme where farmers are paid for the carbon growing in the trees that they plant, using simple low-cost MRV. This is calculated using standard "look up" tables, which output expected carbon sequestration based on simple inputs (ha planted, tree species, location, management regime). The look up tables assume conservative default carbon sequestration factors and conservative defaults for baseline setting and leakage *(e.g. Woodland Carbon Code "small projects" and*

[6] More info: https://www.woodlandcarboncode.org.uk/uk-woodland-carbon-registry

NZ ETS Forestry blocks under 100ha). Farmers self-report and MRV is limited to random and targeted audits, with stiff penalties to incentivise compliance.

- 3. Results-based with more accurate MRV. Same as option 2 but with more accurate (and costly) on-site MRV of forestry stocks *(e.g. Woodland Carbon Code "normal projects" and NZ ETS Forestry blocks under 100ha).* This additional MRV would be costly for participants and administrators but increase the accuracy of estimated carbon sequestration. It would also justify (prove) higher carbon sequestration factors than option 2's conservative defaults.

Governance: All three options could potentially be applied within the CAP framework, although the long management timescales required to ensure permanence may require extra-CAP regulation and/or commitments. Option 2 and 3 could also be administered as a voluntary carbon credit scheme, similar to Woodland Carbon Code. To ensure permanence, additional governance beyond 7-year CAP may be required (e.g. long-term contracts/covenants, Member State co-payments beyond 7-year cycle).

Reward: Payment could be a set payment through CAP per t C02-e permanently sequestered (option 2,3) or in voluntary offset credits (option 2,3). To cover upfront costs, a significant portion of the payment could be made upon acceptance of the project plan, followed by ongoing annual payments up to maximum average permanent sequestration (which are contingent on ongoing MRV approval).

Baseline and additionality: Baseline is set at individual farm level. For option 1 and 2, assume a baseline of no change in carbon stocks without the project. For option 3, participant is required to carry out full baseline assessment that covers tree biomass (above and below ground), litter and deadwood, non-tree above and below ground biomass, and soil carbon, using Woodland Carbon Code equivalent tables, plus external validation. Also, require farmers to report on any expected change in land use outside of the participating farm as a result of their participation in the scheme (to avoid leakage).
For option 2 and 3, to ensure financial additionality (i.e. rational farmer would not afforest without carbon payment), require projects to calculate net present value of land with and without afforestation, and only reward where NPV less than zero without payment.

Monitoring, reporting and verification: Timing of MRV: initial validation to occur before approval of afforestation project (i.e. of project plan). Then, MRV in line with option selected at five years, and then every ten years. MRV should continue after the last payment of credits to ensure permanence. A set of farms should be randomly audited to ensure compliance, with high fines for failing to follow project plan/cheating/lack of MRV data. Reporting requirements should align with CAP where possible, but be sufficient to audit in line with selected option. MRV could either be the same for all farms, or more stringent for larger projects. MRV should also cover broad sustainability indicators (e.g. biodiversity, water quality/quantity impacts).

Permanence mechanisms: To ensure permanence, project plans should cover a minimum of 50 years and farmers required to commit to long-term contracts (e.g. 100 year covenants on land), and be liable for reversals that are intentional or due to mismanagement (by requiring them to buy back equivalent credits or pay fines).

Risk management: For option 2,3, create a carbon reserve in one of the following ways:

- a proportion of the expected sequestration is withheld from participants and placed into a buffer account in the form of credits (e.g. 20%). If sequestration is below project plan expectations or unintentional loss occurs (e.g. fire, wind, disease), then this can be drawn down as long as farmer commits to actions to refill buffer account (e.g. replanting). Alternatively, farmer would have to pay to refill buffer account.
- the buffer size could depend on risk factors *(e.g. California CCOP)*

- no buffer (e.g. NZ ETS).

Agroforestry is the practice of integrating woody vegetation (trees or shrubs) with crop and/or animal systems (e.g. hedgerows, grasslands with scattered trees, low intensity meadow orchards, etc.) Agroforestry can offer multiple benefits, including supporting biodiversity, increasing resilience to climate change, improving water resource management. It also offers significant potential as a carbon sink to mitigate climate change, the recent IPCC special report on Climate Change and Land quantifies that globally agroforestry - could mitigate 0.08 – 5.7 GtCO2 per year. Recent EU H2020 research project AgForward concluded that there is significant potential for expansion of agroforestry in Europe. However, there are challenges to using a carbon sequestration results-based scheme to incentivise agroforestry implementation: the carbon sequestration (and reward) per ha or per farm unit would be relatively small; knowledge barriers seem significant; Agroforestry is broad and context specific, limiting EU-wide scheme applicability and challenging simple MRV. Otherwise, a similar approach to those presented for afforestation could be applied.

Scheme option 4: Soil carbon sequestration on mineral soils

Background

- **Potential for soil carbon sequestration:** The topsoil in Europe's agricultural land stores approximately 51 billion t CO2-e; this is equivalent to more than ten times the EU's annual GHG emissions. Clearly, changes in agricultural soil carbon will significantly affect the EU's ability to meet climate goals. Fortunately, evidence shows that soil carbon levels vary across European farms and soil management approaches (e.g. permanent pasture, irrigation, managing grazing etc.), indicating real potential to manage farmland to increase soil carbon.
- **Some result-based soil carbon schemes already exist:** In Europe, this includes the Healthy Soil for Healthy Food project in Austria, a cooperation between SPAR (a private supermarket chain), 59 farmers, and WWF Austria: farmers receive rewards for growing produce in a manner that increases soil carbon. In Finland, more than 100 farmers have been involved in the Carbon Action project, which aims to identify soil-carbon accumulating practices effective on all farms, with monitoring. The French 'Ferme Laitière Bas Carbone' project also promotes soil carbon on dairy farms. Internationally, the Australian Emissions Reduction Fund has developed a measurement-based soil carbon methodology, building in part on VCS project examples.
- **Key challenges for Soil Carbon** include: 1) Expense and uncertainty of measuring soil carbon; 2) Difficulty of monitoring soil carbon; 3) Reversibility of soil carbon gains (e.g. to changes in management and/or changes in climatic conditions. In general, there are relatively high knowledge gaps relative to the other schemes.

Approach: The aim of the scheme is to incentivise additional soil carbon sequestration on mineral soils. The focus is on arable land (cropping systems), but the approach can also be applied on livestock and mixed farms that manage grasslands and on horticultural land. The scheme can have different levels of ambition, which can link to different measures the available measures under the CAP.

1. Purely informational farm-advice scheme focusing on awareness raising, without requirements for particular management options to be implemented and without requirements for a particular result to be achieved in terms of total sequestration achieved. The payment provided is to compensate farmers and farm advisor for the time spent in preparing a soil management plan and for the soil sampling costs. A look-up tool can be applied, or a carbon audit tool that has sufficient coverage of soil carbon and related management. The farmer prepares a management plan with an advisor that considers the mitigation impact of soil management measures and proposes management actions for farmers to take and outlines management practices to be implemented. Farmers freely choose to apply management options relevant and feasible to them. There is no obligation to apply the measures or conduct follow-up sampling.

2. Non-result based management scheme: Following the initial sampling and the soil management plan, the farmer is required to implement a minimum number of management practices, or those practices that show the most potential for mitigation. The specific requirement for which practices should be applied is determined based on the context and the characteristics of the farming system. In addition to the reimbursement of costs for sampling and farm advice, compensation is given for the additional practices implemented (akin to agri-environment-climate measures). Soil sampling is repeated after 3 – 5 – 7 years to monitor soil carbon level changes and revise the management plan. The difference to a typical activity-based scheme under agri-environment-climate measures is that a menu of practices is offered rather than a single action, or more practices are prescribed and compulsory follow-up is required for sampling. There is no requirement for reaching a particular improvement in SOC levels. Alternatively, a hybrid management / result-based scheme could provide an additional top-up payment if a certain improvement level is achieved (a bonus payment).

3. Result-based SOC sequestration scheme: Results-based scheme where farmers are paid for carbon sequestered in soil, based on measurement at the beginning of the commitment period (baseline measurement) and sampling / measurements following regular intervals, which can be set as flexible intervals with a minimum, and then calculating the difference between pools at a given point in time. The approval of carbon sequestration credits depends on the implementation of at least one of the identified eligible soil management activities. Eligibility/non-eligibility is defined also in relation to different farming systems. The scheme design can build on the measurement-based soil carbon methodology under the Australian Emissions Reduction Fund. The payments can be made in intervals, either as a fixed price payment per additional tonne of CO_2/ha sequestered or in forms of carbon credits to be sold.

Governance: All three options could potentially be applied within the CAP framework, or as part of supply chain management. Option 3 can also be administered as a voluntary carbon credit scheme – i.e. a certification / labelling scheme where voluntary credits are issues and sold on the market.

Baseline and additionality: Baseline is set at individual farm level. Initial soil sampling is used to set a baseline for the individual farm. The sampling strategy needs to be defined i.e. the number of subsamples per ha that can be aggregated in a single sample to account for heterogeneity in the field; samples are then tested in a laboratory. Alternatively, methods are being developed to use infra-red technology to measure the SOC levels and changes (e.g. Australian Emission Reduction Fund).

Monitoring, reporting and verification: MRV for soil carbon is expensive, due to extensive and frequent sampling required, however anticipated that the technology improvements will reduce the cost in the next 5 – 10 years. Several initiatives are under-way to further develop MRV approaches (e.g. Netherlands, Smith et al 2019), which can be built into scheme. In addition to sampling, farmers must document activities, any erosion or other potential reversals and report this as part of regular MRV.

Reward: For information based scheme, payments can be easily linked to CAP payments (e.g. through payments for farm advisory services etc.). For the result-based scheme, payment would be made upon realisation of carbon sequestration i.e. after follow-up sampling, the difference between baseline and follow-up soil carbon is calculated. The amount of credits reflects the actual sequestration achieved over that time-period (equal to the difference between the baseline carbon audit and the follow-up sampling/audit).
Carbon credits are issued and then the payment is either made by: 1) Selling those credits on the voluntary market; 2) receiving payments for sequestration achieved via public funding (CAP scheme), 3) Receiving payments for credits via a supply chain.

Permanence/risk mechanisms: Ensure permanence principally through legal means: following the Australian Emissions Reduction Fund (previously CFI) methodology, projects have a lifetime of 25 or 100 years. For this period, farmers are legally obliged to maintain the carbon and are not permitted to carry out activities on the land that will degrade it. In addition, to help cover uncertainty and/or risk of reversal, create a carbon reserve by discounting expected carbon sequestration by a percentage and retaining these payments as a buffer. If sequestration is below project plan expectations or unintentional loss occurs (e.g. drought), then this can be drawn down as long as farmer commits to actions to refill buffer account (e.g. adjust management to refill). Alternatively, farmer would have to pay to refill buffer account.

Annex III: Speaker bios

Lydie Bernard is the Vice-President and the President of the Agriculture, Agri-food, Forestry, Fisheries and Sea Committee of the Pays de la Loire Region. Lydie is a dairy farmer and has been committed in a dairy technical union and Chambers for Agriculture for many years. Lydie always worked for strong discussions and cooperation along the agrifood chains. She also believes that the agricultural sector is part of the solution for the protection of the biodiversity, the environment, the water quality and the mitigation of the climate change. In this regard, she has been supporting regional projects and actions from the beginning of her regional mandate, such as Low Carbon Farms. Together with other European Regions, she is much involved on discussions on CAP reform and how to better support environmental schemes and protect quality products.

Catherine Bowyer (Senior Policy Analyst, IEEP) is an experienced expert on climate mitigation policy having worked for over 15 years on questions of soil protection, climate mitigation, land use and management. She has worked on technical aspects of climate policies including the delivery of monitoring and report guidance for the EU Emissions Trading System, the analysis of land based climate accounting systems and the development of sustainability criteria for land management supporting the implementation of renewable energy policy in Europe. She has also led work assessing policy for soil protection, working on this topic in Europe since 2002. In the context of the Carbon Farming project, she will be leading Task 3 developing case studies to support the development of clear guidance on the delivery of results-based carbon farming schemes.

Jean Baptiste Dollé is the environment head department in the French livestock institute (Institut de l'Elevage). He works with the national dairy and meat federation, producers, firms, research institute in France and Europe, and public bodies to evaluate the relationships between environment and cattle production. Many studies carried out concern methodologies and tools developed to evaluate impacts (climate change, water pollution and so forth), and to assess the positive contributions (biodiversity, carbon sequestration,…) of milk/beef production. Over the last ten years, he has led carbon farming initiatives in beef and dairy production (engaging 12,000 farmers) with a large national partnership. Recently, he has contributed to the development of a standardized methodology for certifying carbon reductions in agriculture.

Dr. Ana Frelih-Larsen is a Senior Fellow at Ecologic Institute, where she coordinates the Institute's activities on agriculture and soils. She has over 10 years of experience working with stakeholders and the scientific community to support policy-making on agriculture and climate, as well as evaluating existing policies for their impact and coherence in relation to climate mitigation and adaptation. For example, she currently leads the task of analysing barriers, solutions and stakeholder knowledge needs on soil organic carbon management in the H2020 project CIRCASA (Coordination of International Research Cooperation on Soil Carbon Sequestration in Agriculture). In the Carbon Farming study, Ana leads Task 2, which identifies existing and potential carbon farming schemes in the European context and engages with stakeholders via the Roundtable.

Julia Grimault works at I4CE as project manager on the contribution of forests to climate change mitigation. She joined the team in 2014 to take over the coordination of the 'Carbon Forest and Wood Club', which brings together public and private decision-makers and academic research, with the objective of sharing knowledge on technical means and economic incentives to strengthen the role of the forest-based sector in climate change mitigation. She has also worked on forest carbon accounting and carbon certification mechanisms (monitoring, reporting, verification), especially through the coordination of the VOCAL project forest pillar and the contribution to the creation of the French 'Low-Carbon Standard'.

Olivia Herzog is a programme officer at WWF Austria, where she promotes the sustainable transformation of the food system. As a social ecologist with an economic background, Olivia Herzog has dedicated herself to interdisciplinarity. At WWF, her core topics are sustainable diets as well as the reduction of meat consumption and food waste in Austria. Together with an Austrian Retailer and 60 Austrian Farmers she is implementing the project “healthy soil for healthy food” to store carbon, enhance soil health and raise awareness for the importance of soil.

Tatu Hocksell works in Fortum’s public affairs team in Brussels. Mr. Hocksell has been a core team member in Puro CO2 Removal marketplace since its beginning. He acts as the policy and regulation advisor for Puro and engages in the dialogue to make all verified CO2 removal methods relevant in zero-carbon schemes on technology-neutral and fair basis. Mr. Hocksell has Master of Laws (University of Helsinki).

Laura Höijer (PhD Docent) works as a Content Director at Baltic Sea Action Group (BSAG), on a short term leave of absence from the Ministry of the Environment (Research Director). The Content Director leads the BSAG together with the Managing Director. The Content Director is responsible for aligning content and managing BSAG’S programmes, including Carbon Action. The main tasks include speeding up the strategic and constructive cooperation in environmental work.

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).

Anna Lorant (Senior Policy Analyst, IEEP) is an agriculture engineer and environmental economist by training who has been working on climate change and environment related issues in various roles for 9 years. At IEEP, Anna’s focus is on climate action in the agriculture sector, a recent report co-authored by her analyses pathways for a low-carbon transition in the EU agriculture. In the context of the Carbon Farming project, she is also leading on Task 4 that will produce guidance for setting up and implementing result-based carbon farming schemes in EU Member States.

Christine Müller is the DG CLIMA policy officer managing the Carbon Farming Study. Christine entered the European Commission, DG AGRI, in 2004, working on strategy and quantitative assessment. Since 2010, Christine has been covering agriculture and land use issues in DG CLIMA, from the 2011 “Roadmap for moving to a low carbon economy in 2050” over the reference and policy scenarios underlying the 2030 EU climate and energy package to ongoing LULUCF policy implementation and conception. For sustainable food and biomass, Christine is developing a harmonised knowledge system on land and soil management, to feed into robust GHG inventory and Carbon Farming methodology, useful for carbon market piloting for EU agriculture and forestry.

Asger Strange Olesen is LULUCF and carbon farming expert. In 2011 he was the first Annex 1 party policy officer to sign a LULUCF carbon farming project ERPA delivering credits for Kyoto Protocol compliance. He was previously LULUCF desk officer at DG CLIMA and is now Technical Director for Land Use & Climate Change at COWI A/S. Asger serves as the project manager for this study.

Dr. Thorsten Permien is Head of Unit at the Ministry for Agriculture and Environment, Mecklenburg-Vorpommern (Germany). Dr. Permien has worked for the state since 1993 and is responsible for environmental issues and sustainable development in various ministries. He has been deeply involved in the MoorFutures project, which has established and implemented a framework to incentivise peat rewetting for climate mitigation. He has a background in chemistry and sustainable development.

Dr. Pat Snowdon is the Head of Economics and Woodland Carbon Code, Scottish Forestry. Pat has worked in forestry and land-use for 25 years. He joined the Forestry Commission in 2002, heading its economic team and leading the Forestry Commission's climate change work at Great Britain level. He was an author and editor of the 2009 Read Report on the role of UK forestry in helping to tackle climate change, and chairs the team that has developed the UK Woodland Carbon Code. In April 2019, Pat transferred to Scottish Forestry, a new government agency set up as the forestry authority in Scotland. His team continues to deliver economic advice and management of the Woodland Carbon Code on behalf of all the forestry authorities in the UK. A key part of Pat's current work is to help develop markets in forest ecosystem services, in particular to attract additional finance into woodland creation and management.

Daniel Zimmer is the Director of the Sustainable Land Use theme at EIT Climate-KIC, which he joined in 2010 as its Director for Innovation. He developed and supervised the implementation of its portfolio of innovation projects aiming to accelerate the transition to a low carbon and climate-resilient economy and society. He has global experience on climate and water related issues spanning from engineering to geopolitics, including 8 years as Executive Director of the World Water Council, an international umbrella organisation of the water sector.