Technical Guidance Handbook

Setting up and implementing result-based carbon farming mechanisms in the EU

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Abbreviations

A/R CDM	Afforestation/Reforestation Clean Development Mechanism
AECM	Agri-Environment-Climate Measure
AFOLU	Agriculture, Forestry and Other Land Use
BLKB	*Basellandschaftliche Kantonalbank*
C	Carbon
CAP	Common Agricultural Policy
CAP'2ER	*Calcul Automatisé des Performances Environnementales en Elevage de Ruminants* (Automated Calculation of Environmental Performance in Ruminant Breeding)
CAR	Climate Action Reserve
CCOP	California's Carbon Offset Program
CDM	Clean Development Mechanism
CH_4	Methane
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CRF	Common Reporting Format
CSP	CAP Strategic Plan
EAFRD	European Agricultural Fund for Rural Development
EAGF	European Agricultural Guarantee Fund
ESS	Ecosystem Services
EF	Emission Factor
EIP-Agri	Agricultural European Innovation Partnership
ETS	Emissions Trading Scheme
FLBC	*Ferme Laitière Bas Carbone* (Low Carbon Dairy Farm)
GAEC	Good Agricultural and Environmental Conditions
GHG	Greenhouse Gas
GHGI	Greenhouse Gas Inventory

$GtCO_2eq$	Gigatonnes of carbon dioxide equivalent
GWP	Global Warming Potential
HNV	High Nature Value
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
KP	Kyoto Protocol
LEADER	CAP instrument supporting links between actions for the development of the rural economy
LIFE	EU funding instrument for the environment and climate action
LUCAS	Land Use and Coverage Area frame Survey
LULUCF	Land Use, Land Use Change and Forestry
MRV	Monitoring, Reporting and Verification
MS	Member State
$mtCO_2eq$	Metric tonnes of carbon dioxide equivalent
N	Nitrogen
N_2O	Nitrous oxide
NIR	National Inventory Report
PDD	Project Development Document
RDP	Rural Development Programme
REDD+	Reducing Emissions from Deforestation and Forest Degradation. Mechanism developed by Parties to the UNFCCC to reduce deforestation and forest degradation in developing countries.
SMR	Statutory Management Requirements
SOC	Soil Organic Carbon
tCO_2eq	Tonnes of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
WTO	World Trade Organisation

Glossary

Action-based carbon farming: a scheme where a farmer or landowner receives a payment for implementing defined management actions, independently of the resulting impact of those actions.

Agroforestry: the practice of deliberately integrating woody vegetation (trees or shrubs) with crop and/or livestock production systems to benefit from the resulting ecological and economic interaction

Farm carbon audit tool (audit tool): a computer model that calculates a farm's Greenhouse Gas (GHG) emissions and/or carbon sequestration based on input data that summarise the farm's management others. They can also calculate other outputs, including sustainability indicators such as nutrient runoff or emissions intensity.

Hybrid approach/model: a scheme that uses a combination of result-based and action-based payments on the same parcel of land.

Carbon leakage: refers to the situation that may occur if the displaced agricultural production is transferred to other land, where there is a consequent rise in net GHG emissions as a result of the transfer.

Peatland: land that contains peat in the sense of a histic horizon (e.g. mires, moors, meadows). A histic horizon is a soil layer near the surface which, when not subject to drainage, consists of poorly aerated organic material which is water saturated (or would be in the absence of drainage) for 30 consecutive days or more in most years.

Result-based carbon farming: a scheme where a farmer or landowner receives a payment for reducing net GHG fluxes from their land, whether that is by reducing their GHG emissions or by sequestering and storing carbon. A result-based approach requires a direct and explicit link between the results delivered (e.g. GHG emissions avoided or carbon sequestered) and the payments that the land manager receives. It differs from the more familiar action-based schemes, where the farmer is paid for complying with very specific farming practices or technologies, which have been selected by the managing authority for the assumed climate mitigation benefits.

1. Introduction for the reader

This Technical Guidance Handbook is intended to support the development of result-based payment schemes for carbon farming in the EU. The Handbook has been prepared as part of a wider study *Analytical support for the operationalisation of an EU Carbon Farming Initiative,* funded by the European Commission, which explores the options for wide-scale adoption of result-based carbon farming schemes or initiatives linked to climate change mitigation and adaptation.

The Guidance is based on the two published reports from the first part of the study:

- **a review and analysis of existing international and EU carbon farming schemes** (COWI et al., 2020); and

- **the Annexes to this Technical Guidance Handbook**, five detailed case studies of emerging result-based carbon farming initiatives in the EU, based on analysis of published documents and interviews conducted with stakeholders (COWI et al., 2021). The case studies examine five key thematic areas, analysing the potential for using result-based carbon farming payments in an EU context: peatland restoration and rewetting; agroforestry; maintaining and enhancing soil organic carbon (SOC) in mineral soils; managing SOC on grasslands; and livestock farm carbon audit.

The Guidance also draws on relevant EU experience of result-based payment schemes for farmland biodiversity, developed over the past 25 years[1].

1.1. Who is this Technical Guidance Handbook for?

This guidance is for public authorities, non-governmental organisations (NGOs) and private organisations interested in developing and implementing result-based payment schemes for carbon farming at national, regional or local scale. It will also be of use to environmental and agricultural specialists who might wish to contribute to such schemes.

It is assumed that readers are already familiar with the EU climate policy initiatives on climate mitigation and adaptation within the agricultural sector, and with the legislative proposals for the Common Agricultural Policy (CAP)[2].

Although the focus of the Handbook is on result-based payment schemes for carbon farming, many of the key principles of good design apply equally to the more familiar action-based payment schemes, and to hybrid schemes (where an action-based payment is topped up by a result-based element rewarding higher-level achievements).

[1] For more information on these see https://ec.europa.eu/environment/nature/rbaps/index_en.htm

[2] References to CAP legislation for the 2021-27 are based on the proposed legislative text COM/2018/392 final - 2018/0216 (COD)

1.2. How to use the Technical Guidance Handbook

Throughout this Technical Guidance Handbook you will find:

Key advice displayed in orange

Decision trees to guide you through key points in the process of setting up a carbon farming scheme.

Case study examples displayed in blue

Chapter 2 **sets the context** for the rest of the Handbook, explains what is meant by carbon farming and why it is now so important in an EU context, and outlines the principles of result-based payments.

Chapter 3 explains how to undertake the **initial feasibility assessment required for any carbon farming scheme,** whether action-based or result-based.

Chapter 4 outlines the process of **planning the development of a result-based carbon farming scheme,** the resources needed and the options for funding, scope and governance.

Chapter 5 guides the reader through **the key steps in setting up a result-based carbon farming scheme** – development, implementation and evaluation.

Chapter 6 explains the importance of **stakeholder engagement, capacity building and transparency.**

Chapter 7 discusses how to facilitate **the development and adoption of carbon farming schemes in the EU.**

Chapter 8 **summarises the key findings and recommendations of the five case studies on result-based carbon farming payments** for peatland restoration and rewetting, agroforestry, maintaining and enhancing SOC in mineral soils and grasslands and livestock farm carbon audit.

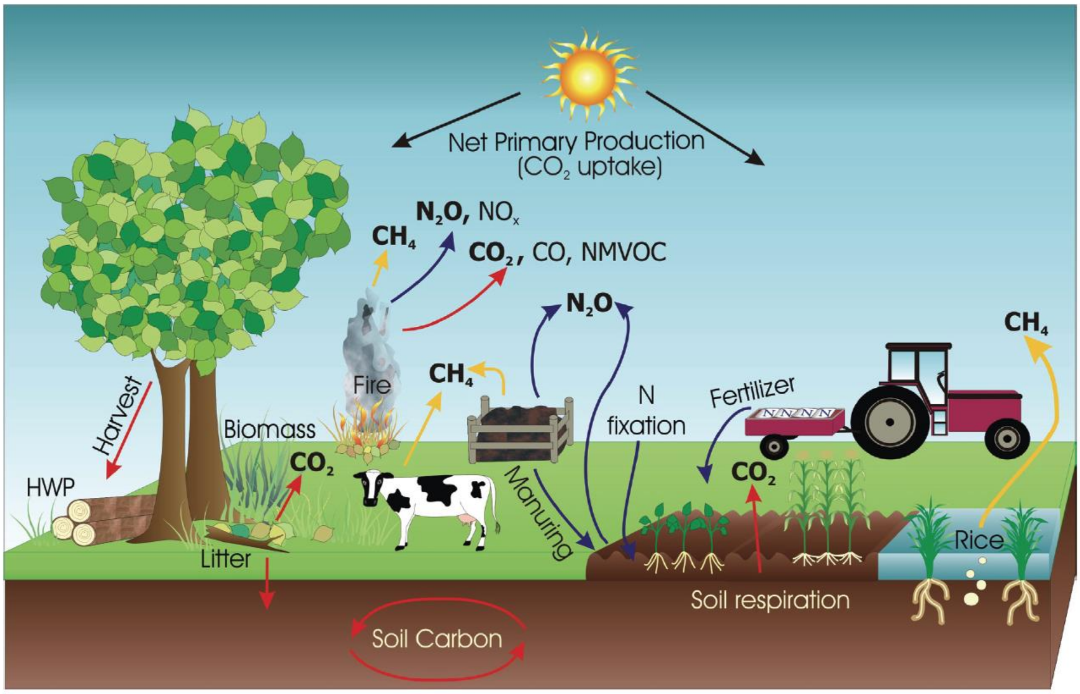
2. The context for result-based carbon farming in the EU

This chapter sets the context for the rest of the Handbook, explains what is meant by carbon farming and why it is now so important in an EU context. It also outlines the principles of result-based payments.

2.1. What is carbon farming?

Carbon farming refers to the management of carbon pools, flows and GHG fluxes at farm level, with the purpose of mitigating climate change. This involves the management of both land and livestock, all pools of carbon in soils, materials and vegetation, plus fluxes of carbon dioxide (CO_2) and methane (CH_4), as well as nitrous oxide (N_2O) (which is included among relevant fluxes of GHGs in the agricultural sector by the Intergovernmental Panel on Climate Change (IPCC) and therefore is considered part of carbon farming). This is illustrated in Figure 1.

Figure 1 The main greenhouse gas emission sources/removals and processes in managed farmland



Source: IPCC (2006)

2.2. Why is carbon farming so important in the EU?

Carbon farming and carbon forestry are land management concepts that first gained interest in a global context after the Kyoto Protocol (KP) came into force in 2004. Several countries and organisations, such as New Zealand and the Verified Carbon Scheme (VCS), started testing and exploring market-based schemes offering land managers incentives for managing terrestrial carbon at farm or parcel level. In recent years, since the Paris Agreement and the recognition of nature based solutions as a key to achieving climate neutrality by 2050 at the latest, interest from the private sector has increased. Despite this, no national or international compliance scheme has recognized mitigation outcomes from action in the Land Use, Land Use Change And Forestry (LULUCF) sector in the form of credits.

In the EU, the European Green Deal from 2019[3] changed the context. The Farm to Fork Strategy[4], the Circular Economy Package[5] and the forthcoming Fit for 55% Communication[6] make clear that the land-based sector needs more and better incentives for managing carbon, in order to drive the necessary transformational change towards 2050. Enhancing land managers' understanding and application of carbon farming will be a critical enabling factor, together with a robust and transparent governance system that defines common and clear rules for monitoring, reporting and verification (MRV) and use of the results from carbon farming activities. The EC will develop a regulatory framework to monitor and verify the authenticity of carbon removals in agriculture (and forestry)[7], for publication in 2023. An EU Carbon Farming Initiative, to be launched in 2021, will promote this new business model. This Guidance Handbook and the supporting studies will inform these policy developments and support Member States and regional authorities in setting up result-based carbon farming pilots and eventually schemes in the years towards 2030.

2.3. What are result-based schemes for carbon farming?

EU farmers have long been offered incentives to improve their farming practices and safeguard the environment, for example through agri-environment-climate payments and environmental investment support co-financed by Pillar 2 of the CAP. These incentives are commonly *action-based payments* for compliance with very specific farming practices or technologies which have been selected by the managing authority for the assumed environmental benefits. Few schemes or projects have offered *result-based payments*, where the incentive payment is linked to measured outcomes on the farm, irrespective of the precise farming practices that are applied.

The concept of result-based payments is not new, having been in operation in the EU for more than 20 years, largely focussed on specific farmland biodiversity objectives. Recent on-farm pilots have provided valuable insights into using result-based payments for biodiversity within the CAP, whereas research on and initiatives using such payments for other objectives, such as carbon farming, water quality and soil functionality, are still in their infancy. Nonetheless, there are valuable experiences also available from non-EU schemes such as voluntary carbon market standards, as well as emerging projects within the EU, that offer lessons to be learned and inspiration. Drawing on these, this Technical Guidance Handbook aims to support more organisations and Member State/regional managing authorities in offering EU farmers result-based incentives for carbon farming.

Result-based incentives offer several advantages, compared to action-based incentives, but also have challenge and limitations. Advantages, challenges and limitations are summarised in Box 1.

[3] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
[4] COM(2020) 381 final
[5] https://ec.europa.eu/food/farm2fork_en
[6] https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1940
[7] As announced in the Circular Economy Action Plan COM/2020/98 final.

Box 1 Advantages, challenges and limitations of a result-based scheme for carbon farming

Advantages of a result-based scheme for carbon farming:

- flexibility for the farmer – encouragement of adaptability, innovation and entrepreneurship;
- clearer link between payment and carbon impacts for buyers – higher credibility/appeal and potential for higher additionality;
- carbon impacts are an objective, and not a side-effect of sustainable agriculture – potentially higher effectiveness;
- lower adverse selection of parcels with lower yields by farmers (i.e. with lower opportunity costs);
- educational role for farmers and wider society.

Challenges and limitations of a result-based scheme for carbon farming:

- potential higher financial risks/uncertainty for farmers;
- potential higher transaction costs for developers;
- challenges related to monitoring, reporting and verification of climate mitigation results (costs, degree of reliability/robustness);
- challenges of ensuring additionality and of securing permanence of the carbon impacts;
- the time needed for change in reliable measurements is potentially long, and in some cases the change is appreciable only after the project life span;
- higher flexibility given to farmers also means that strong advisory support needs to be built into scheme design; however, capacity or resources for this may be lacking.

3. Initial feasibility assessment

A result-based payment approach to environmental land management in general and carbon farming in particular has several potential advantages over an approach based on payment for actions. A considerable number of result-based schemes to conserve biodiversity on farmed land already exist, but result-based carbon farming is a very novel approach in Europe. While this is rapidly changing and multiple initiatives are emerging, there are currently only a few, small-scale examples in operation within the EU. Given the limited experience available thus far, it is important to first explore the feasibility of a result-based scheme before committing substantial resources to the scheme's development.

This initial feasibility assessment has two steps:

- assessing the potential to deliver climate impacts together with co-benefits, whether via an action-based or a result-based scheme; then
- assessing the feasibility of a result-based scheme.

3.1. Assessing the potential to deliver climate impacts with co-benefits

The experience within Europe and around the world suggests that the first step towards deciding whether to set up any carbon farming scheme, *whether action-based or result-based,* should be an assessment of the potential to deliver climate impacts, while also contributing to other objectives. The following questions should be addressed during this initial assessment:

- ***Significant climate mitigation benefit***: Does the scheme have potential in terms of its total impact on GHG emissions or carbon sequestration? This depends on both the scale of current emissions that would be addressed by the scheme, and the scheme's ability to significantly decrease emissions or enable carbon sequestration if implemented.
- ***Broad coverage***: Does the scheme have the potential to be widely applied within the target area?
- ***Co-benefits***: Does the scheme incentivise climate actions that have the potential to deliver climate adaptation, environmental or socio-economic co-benefits (for example biodiversity conservation, soil's water holding capacity and stability, reduced soil erosion, flood and drought mitigation, additional jobs in rural areas)?

If any carbon farming scheme is to succeed in an EU context there are other questions, common to all environmental land management schemes, to consider:

- Is the proposed scheme compatible with practices typical of the main farming systems in the EU?
- Are the climate and other benefits verifiable by monitoring agencies at reasonable cost?
- Can the scheme be implemented without imposing excessive financial burdens on the landowner or land manager?
- Is the scheme compatible with improvements in business efficiency?
- Is the scheme compatible with other CAP environmental support measures?
- Is the scheme likely to be socially acceptable?

- Would it be possible for different farmers to implement the scheme consistently?

3.2. Assessing the feasibility of a result-based scheme

An important next step should be to determine whether the scheme is likely to be suitable for a result-based payment. If not, an action-based or hybrid scheme may be feasible.

Given the urgency of the response to climate change and the comparative novelty of result-based carbon farming, it is important to consider at the initial assessment stage whether the scheme has the potential to be quickly progressed and scaled up, either through immediate implementation at the regional scale, or in a stepwise approach by developing pilot projects to identify solutions to significant barriers.

There are several possible outcomes of this initial feasibility assessment:

1. There is insufficient evidence that the proposed farming actions will achieve significantly reduce net carbon emissions, so a carbon farming scheme is not currently feasible at this stage;
2. Consider developing an action-based scheme, but not a result-based scheme;
3. Consider developing a hybrid scheme but not a 'pure' result-based scheme;
4. Consider developing a pilot result-based scheme;
5. Consider developing a full-scale result-based scheme.

The decision tree at Figure 2 summarises the process of the initial feasibility assessment and provides links to the relevant sections of the Handbook.

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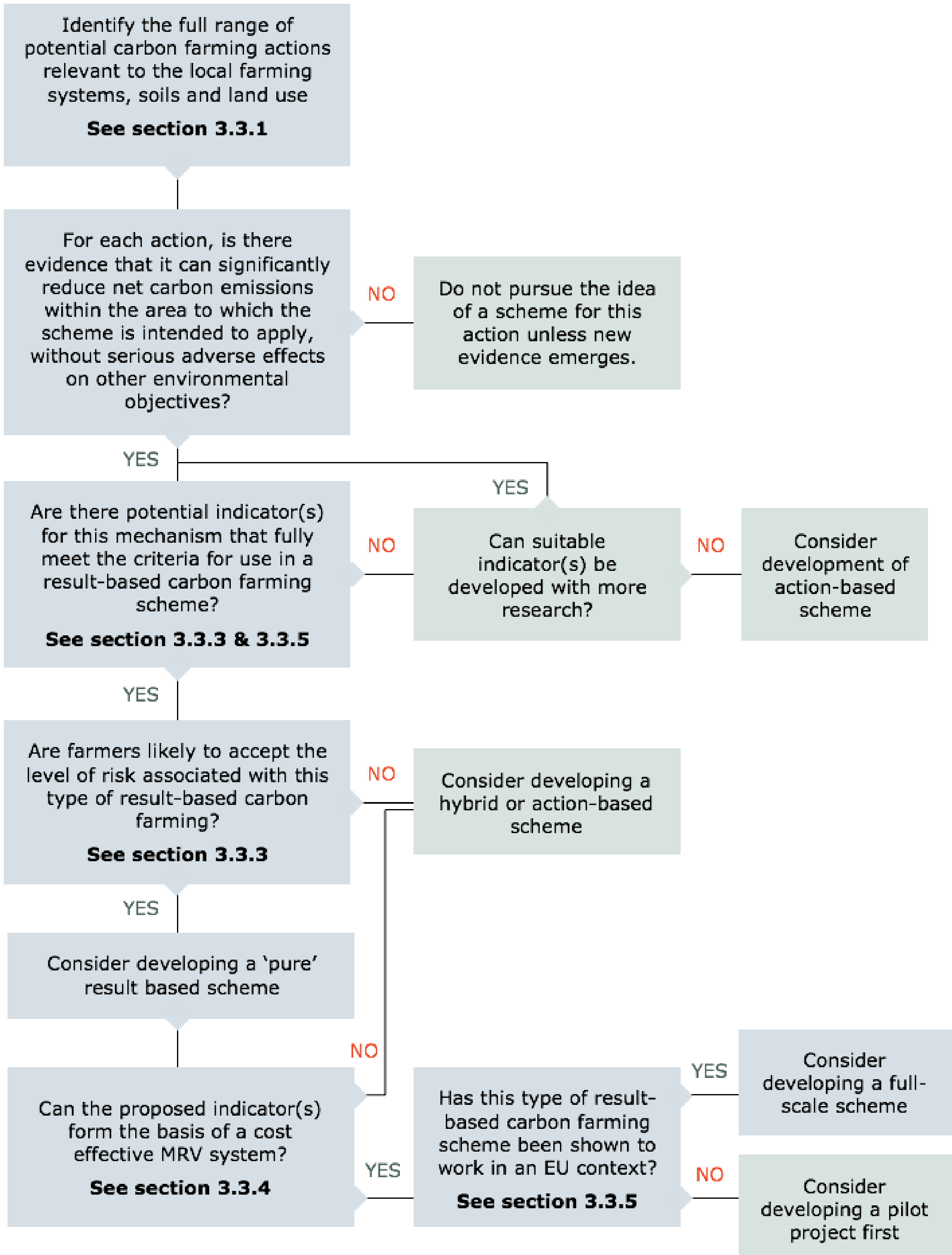
Figure 2 Initial feasibility assessment



3.3. Identify potential carbon farming schemes relevant to the land and farming systems in the target area

3.3.1. Climate mitigation benefits

The potential contribution to climate mitigation should be the first aspect to consider in any assessment of potential schemes. The key factor to consider is the **potential scale of the contribution, measured in tonnes of carbon dioxide equivalent per year (CO_2eq/y).**

Because the mitigation achieved in practice is highly dependent on both the agro-ecological context (soil, climate, farming system) and the way in which farming practices are implemented at farm and plot level, it is difficult to provide generalised predictions of precise contributions of specific farming practices to reducing GHG emissions or contribute to carbon sequestration. More detailed assessments of the relative climate mitigation potential of different land management options at EU level can be found in Martineau et al. (2016).

Alongside the scale of climate mitigation benefits, this study has identified a series of other factors that should be considered when assessing potential carbon farming schemes. These are:

- **permanence** of the carbon pool and GHG emission reductions (and level of reversal risk through changes in land management or catastrophic events such as fire);
- **additionality**, which is particularly important when emission reductions are used as offsets. Additionality means that the scheme produces desirable results that would not have happened without it;
- **risk of carbon leakage** or displacement of an activity or land use that is limited by a scheme to another location, where it leads to increased emissions;
- **uncertainty** of the accuracy or reliability in the measurement of results due, for example, to errors, lack of data, modelling assumptions or estimations of future values.

Examples of mitigation actions at farm level to manage carbon and GHG fluxes, identified to be relevant within the EU context. Some of the practices and land use changes that have potential for carbon farming.

Table 1 lists some of the practices and land use changes that have potential for carbon farming.

Table 1 Examples of mitigation actions at farm level to manage carbon and GHG fluxes, identified to be relevant within the EU context

Group	Mitigation actions
Land Use	Conversion of arable land to grassland to sequester SOC
	New agroforestry
	Wetland/peatland conservation/restoration
	Woodland planting

	Preventing deforestation and removal of farmland trees
	Management of existing woodland, hedgerows, woody buffer strips and farmland trees
Cropland Management	Improved crop rotations
	Reduced and minimum tillage
	Leaving crop residues on the soil surface
	Ceasing to burn crop residues and vegetation
	Use of cover/catch crops
Livestock Management	Livestock health management
	Use of sexed semen for breeding dairy replacements
	Choosing breeds with lower methane emissions
	Feed additives for ruminant diets
	Optimised feeding strategies for livestock
Nutrient and Soil management	Soil and nutrient management plans
	Improved nitrogen efficiency
	Biological N fixation in rotations and in grass mixes
	Improved on-farm energy efficiency

Source: adapted from Martineau et al. (2016)

3.3.2. Assessing co-benefits

It is also important to consider co-benefits at an early stage, since the response to climate change needs to be fully integrated with that to other pressing environmental and social issues, most notably the continuing decline of biodiversity across Europe and the need to adapt to climate change. As an example, Box 2 lists the main co-benefits identified for agroforestry and the retention of woody landscape features.

Box 2 Co-benefits identified in the agroforestry case study

Reduced soil erosion and nutrient leaching

Improved soil functionality and water infiltration

Diversified income streams for farm businesses

Improved animal welfare (shade and shelter)

Pollination services

In the case of long-established features and systems, the conservation of biodiversity and landscape character

Source: COWI et al., 2021 (Annex II)

Many climate mitigation actions automatically deliver environmental co-benefits, but this cannot be assumed without a careful analysis.

One example of a potentially negative impact is the potential to displace food production and disrupt food processing enterprises that could be associated with large-scale rewetting of highly productive drained peatlands. This also illustrates the need to manage, to the extent it is possible, the interactions of result-based farming schemes with other policy instruments.

3.3.3. Assessing suitability for a result-based scheme

The advantages and limitations of result-based carbon farming schemes have been set out in Chapter 2. Where they are practical and cost effective, result-based schemes have advantages over action-based schemes.

Two factors are central to determining whether a cost-effective result-based scheme is feasible:

- the ease and degree of certainty with which the results can be measured;
- the degree of risk to which the result-based approach exposes the farmer.

More detail on indicators and monitoring regimes is provided in sections 5.3 and 5.4 but at the initial feasibility stage it is useful to consider whether there is a methodology for measuring the impact of a carbon-farming scheme on net GHG emissions (measured in tonnes of CO_2eq) that could meet the following criteria for indicators used in result-based schemes.

Indicators used to reward land managers in result-based payment schemes should be:

- directly and robustly linked to the desired outcome at farm/plot scale;
- consistently measurable using a simple methodology;
- sensitive to changes in agricultural management within a reasonable time frame, but otherwise stable;
- unlikely to be influenced by external factors beyond the control of the land manager.

If there is an indicator or potential indicator that meets these criteria, then it is worth considering a result-based scheme.

Result-based schemes also expose farmers to the risk of non-delivery. If an indicator is sensitive to changes in agricultural management, then the farmer will have a degree of control over this risk, but experience has shown that almost all indicators can also be influenced by external factors beyond the farmer’s control. Weather extremes are known to affect the indicators used in result-based schemes for biodiversity and could also affect result-based carbon farming schemes. Periods of drought could, for example, make it more difficult to re-wet peatlands and could increase the risk of wildfires and consequent permanent loss of peat.

The risk of non-delivery may be a major factor limiting the uptake of a result-based scheme. Where the risk is high it may be worth considering either an action-based or a hybrid scheme as an alternative.

In **action-based schemes**, farmers are paid for actions they either take or refrain from, for which there is evidence of a link to a desired outcome, so the risk of non-delivery of the outcome is borne by the body running the scheme. In **hybrid schemes** farmers usually receive an action-based base payment and a bonus payment if the desired result is achieved, so the risk is shared.

3.3.4. Assessing cost effectiveness of monitoring, reporting and verification (MRV)

Assessment of cost effectiveness of a potential carbon farming incentive should consider the additional net cost or opportunity cost to the farm business of the management needed to achieve the mitigation benefit, and set this against the scale of the potential mitigation benefit. It also needs to take into account the transaction costs and other overheads associated with the scheme, both to the administering body and the participant farmers. These costs are a consideration for all environmental land management schemes, but are a particular issue for result-based schemes, where the cost of the MRV of the result indicators can be very high.

In result-based schemes, there is a trade-off between the cost of MRV and certainty of results achieved. Modelling approaches to determining the net reduction in GHG emissions and/or using indirect, proxy, physical indicators will often be cheaper and simpler than direct measurement, but are also likely to be less precise and have greater levels of uncertainty.

If levels of uncertainty are high, that may be an obstacle to market-based funding of a scheme, as the criteria for tradeable carbon credits are stringent. The level of uncertainty will therefore also have an impact on the types of funding that may be used.

3.3.5. Likelihood of swift progress (scalability)

Given the urgency of responding to climate change, this is an important consideration. Developing any environmental land management scheme from scratch takes a considerable time. If a scheme has already been piloted or shown to work, particularly in an EU context, this will most likely make the development of a new large-scale scheme quicker and simpler.

The analysis by COWI et al. (2020) of EU and global experiences on carbon farming schemes and results-based payments linked to climate objectives identified factors likely to affect progress towards large-scale implementation of result-based carbon farming in the EU. These are summarised in Box 3.

Box 3 Some factors affecting wider uptake of effective result-based carbon farming schemes

There are two main challenges to large-scale implementation of result-based carbon farming schemes in the EU, which should be addressed at the scheme design stage. These are factors limiting farmer participation, and factors limiting the ability of a scheme to effectively and efficiently deliver climate impact.

Effectiveness in this context means additional, actual, and permanent sequestration of carbon or avoided emissions, and efficiency means considering social costs and benefits, including environmental and social externalities, at all stages of design.

The climate impact may be impeded by barriers such as loopholes, inconsistent policies, carbon leakage or negative externalities.

Source: COWI et al. (2020)

There are a considerable number of existing result-based schemes designed to conserve biodiversity on farmed land and some of the experience gained from these schemes is relevant when deciding whether a result-based scheme is feasible (see Box 4).

Box 4 Some key lessons from result-based payment schemes for biodiversity conservation on farmland

The following factors were amongst those identified as critical for the design of effective result-based payments for biodiversity in guidance published in 2014 (Keenleyside et al., 2014):

- Setting an environmental objective that farmers can understand and achieve with a reasonable level of certainty;
- Choosing result indicators that are well correlated with the biodiversity objective, are relatively stable and respond to management but are not unduly influenced by factors beyond the farmer's control, as well as being easy to measure;
- Providing high levels of facilitation, advice and support to farmers, especially where they need to alter their normal farming practices to achieve the biodiversity results;
- 'Tuning' the scheme, so that indicator thresholds are set at the right level to encourage participation and to maintain or improve conservation conditions;
- Securing the positive engagement of farmers and other key stakeholders in scheme development, without diluting the environmental focus of the scheme;
- Using the 'freedom to farm' that result-based schemes allow to build farmers' acceptance, understanding of and interest in environmental land management;
- Developing a simple, objective, repeatable and unambiguous method of measuring result indicators that farmers can understand and use to assess their own performance and to facilitate adaptive management;
- Testing scheme design and operation in a pilot that offers farmers experience of a result-based approach and allows staff and farmers to develop expertise in and enthusiasm for result-based schemes. These will then train others and act as advocates for a result-based approach;

- Encouraging innovation, self-help and mutual learning, and finding positive ways of harnessing the power of peer group pressure and support from the local community;
- Implementing a robust system of evaluating the achievement of the biodiversity and other objectives, linked to a timely review process to ensure lessons are learnt and acted upon.

Since 2014, operational experience with result-based payments for biodiversity has continued to accumulate. The final reports of recent European-funded pilots in the UK (Chaplin et al., 2019), Ireland and Spain (Byrne et al., 2018 and Maher et al., 2018) include a useful list of lessons learned, including the following:

- Result-based measures require ongoing validation;
- Proxy indicators need to be extensively tested in the field to identify any potential unforeseen/perverse outcome;
- Weather is a significant factor that affects both agricultural and environmental results.

The experience gained with these biodiversity schemes suggests that setting up successful result-based carbon farming schemes will require a sound evidence base, good data, will take time, will need to actively involve the key stakeholders, including farmers, and will need adequate investment in advice and support.

3.3.6. Applying the initial feasibility assessment to the case studies

As part of this study, an initial analysis was conducted of existing non-EU result-based schemes, lessons learned from these, as well as barriers and possible solutions to result-based schemes. On the basis of this analysis, five case studies were selected that examined in detail existing projects operating within Europe that are trialling result-based schemes for carbon farming or integrate partially elements of a result-based approach. The topics of the case studies are:

Peatland restoration and rewetting

Natural state peatlands are an important and significant carbon sink, actively sequestering and storing large amounts of carbon, but much of Europe's peatland has been drained and degraded and as a result is releasing carbon. The EU is the world's second largest emitter of GHG from drained peatland (220 mtCO_2eq/year), equivalent to around 5% of total EU GHG emissions in 2017 and 10% of the EU agriculture GHG emissions. The countries with the largest peatland emissions are Germany, Finland, the United Kingdom, Poland, Ireland, Romania, Sweden, Latvia, Lithuania, and the Netherlands (O'Brolchain et al., 2020). Restoration and rewetting of drained peatland is a promising carbon farming option where there are extensive areas of farmland on peat soils.

Agroforestry

Agroforestry is the practice of integrating woody vegetation (trees or shrubs) with crop and/or animal production systems on the same plot of land. Examples include large areas of *dehesa* and *montado* on the drylands of Spain and Portugal, permanent crop systems in south-eastern Europe and the wood pastures and *bocage* landscapes further north. These long-established farming systems retain stores of carbon, but many are at risk of degradation or removal of the woody elements and consequent release of carbon. The potential contribution of agroforestry to climate change mitigation is through restoring and maintaining these long-established systems and introducing new agroforestry on arable and grassland farms across the EU.

Maintaining and enhancing SOC in mineral soils

SOC has proven benefits for soil quality, agricultural productivity, and climate mitigation and adaptation. Maintenance of existing SOC levels is crucial given that the estimated EU annual emissions from mineral soils under cropland are 27 mtCO_2eq. Mineral soils also have significant potential for SOC sequestration, but this varies considerably at farm and plot level because of the heterogeneity of soils, climatic conditions, existing SOC levels and management practices. Management practices that benefit SOC levels, including cover cropping, improved crop rotations, agroforestry, preventing conversion to arable land and conversion to grassland.

Livestock farm carbon audit

The European livestock sector is responsible for 81% of all Europe’s agricultural emissions. On-farm changes in herd management and feeding, animal waste management, crop management, fertiliser and energy consumption, can help to reduce livestock GHG emissions cost-effectively. Whole farm carbon audit tools are computer programmes that calculate a farm’s GHG emissions (and other indicators such as nitrogen balance, based on input data that summarise the farm’s management elements. A livestock farm carbon audit can help to incentivise climate action on reducing GHG reductions below the existing baseline level.

Managing SOC on grasslands

This case study is concerned with four types of grassland conversion and management that contribute to carbon sequestration on grasslands, through changes in SOC. These are the: ongoing management of existing grasslands; conversion of 'fallow/set-aside' areas to grasslands; replacement of annual cropland with grassland, including arable land that is economically marginal, such as sloping land or shallow soils, which are especially suitable for grassland management; and avoided emissions from averted conversion of grasslands to arable land on soils that are suitable for cultivation. Changes in biomass, since the latter is subject to high fluctuations.

Table 2 is an illustrative example in which the initial assessment criteria (described above) have been applied to the five case studies.

Table 2 Applying the initial feasibility assessment process to the five carbon farming case studies

Case study	**Peatland restoration and rewetting**	**Agroforestry**	**Maintaining and enhancing SOC in mineral soils**	**Livestock farm carbon audit**	**Managing SOC on Grasslands**
Climate mitigation potential	At EU level, mitigation potential of between 0.3 and 3 $GtCO_2eq/yr$ from restoration and conversion of drained, degraded peatlands. Potential per ha is high.	Potential varies widely with type of system, soil/climate, tree species and density, and other local factors. EU level estimates range from 8 to 234.85 million tCO_2eq/yr.	EU farmland stores approximately 51 billion tCO_2eq in topsoil (equivalent to >10 times the annual EU emissions). Potential for additional C sequestration and need to maintain current stocks.	The livestock sector is responsible for 81% of EU agricultural emissions. Applying climate actions on EU livestock farms could potentially reduce their emissions by 12-30% by 2030.	Potential for additional C sequestration higher on degraded, overgrazed grasslands
Potential for result-based payment	Existing mechanisms all use avoided emissions as a metric. Land use, water table and vegetation are relevant indicators to classify land and estimate emission factors.	Indicators of carbon stored above ground in woody biomass available (e.g. Woodland Carbon Code). Measuring C below ground is difficult.	Two main approaches to monitoring SOC changes: measurement by sampling and estimation by modelling.	Farm Carbon Audit tools are suitable for result-based payments, but accuracy depends on parameterising tools to local conditions and on reliable input data (e.g. regarding farm management).	Two main approaches to monitoring SOC changes: measurement by sampling and estimation by modelling. Changes in biomass are subject to high fluctuations.
Cost-effective MRV	Yes, for land use, water table and vegetation indicators, using ground and/or aerial survey	Yes, but only for above ground woody biomass.	Not yet. Current costs of sampling and modelling are high and a key barrier to feasibility. Uncertainty of modelling at a granular scale is also high. Developments anticipated to reduce costs in future.	Yes, but scheme designers and participants must accept some degree of environmental uncertainty in the estimated emission reductions.	Not yet. Current costs of sampling and modelling are high and a key barrier to feasibility. Uncertainty of modelling at a granular scale is also high, due to spatial variations in SOC

Case study	**Peatland restoration and rewetting**	**Agroforestry**	**Maintaining and enhancing SOC in mineral soils**	**Livestock farm carbon audit**	**Managing SOC on Grasslands**
Scalability	Result-based payment schemes not yet established, but potential mitigation benefits per ha are high.	Result-based payment schemes at pilot stage, but potential for adoption on all farming systems (except drained peatlands).	Costs and uncertainty of MRV for SOC undermine the cost- effectiveness of large scale result-based schemes.	On-farm climate actions can cost-effectively reduce livestock GHG emissions.	Costs and uncertainty of MRV for SOC undermine the cost- effectiveness of large scale result-based schemes.
Co-benefits	Biodiversity is greatest from full peatland ecosystem restoration. Flood peak reduction and improved water quality	Climate adaptation, biodiversity, soil health, water infiltration and income diversification	Soil health, water holding capacity, stability of yields, economic. Significant climate adaptation effects.	Depend on specific actions implemented but may include reduced N run-off, climate adaptation, lower costs.	Biodiversity, water quality and soil productivity.
Concerns	Potential carbon leakage, due to possible displacement of agricultural production; also concern about permanence, due to the reversibility of the changes.	Potential carbon leakage, due to possible displacement of agricultural production and also permanence, due to the reversibility of the changes.	Major concern is the high reversibility of any gains in SOC in mineral soils.	Negative externalities can also arise, with some specific actions. Scheme design should discourage these.	Reversibility of any gains in SOC, and timescale before significant changes can be detected. Arable conversion to grassland has potential risk of carbon leakage, due to possible displacement of production.

Source: own compilation, based on the case study reports (COWI et al., 2021 Annexes I to V)

The summaries and conclusions of each of the case studies are in Chapter 8 and the full reports of the case studies accompany this Guidance Handbook, as separate Annexes (COWI et al., 2021).

4. Next steps - planning scheme development

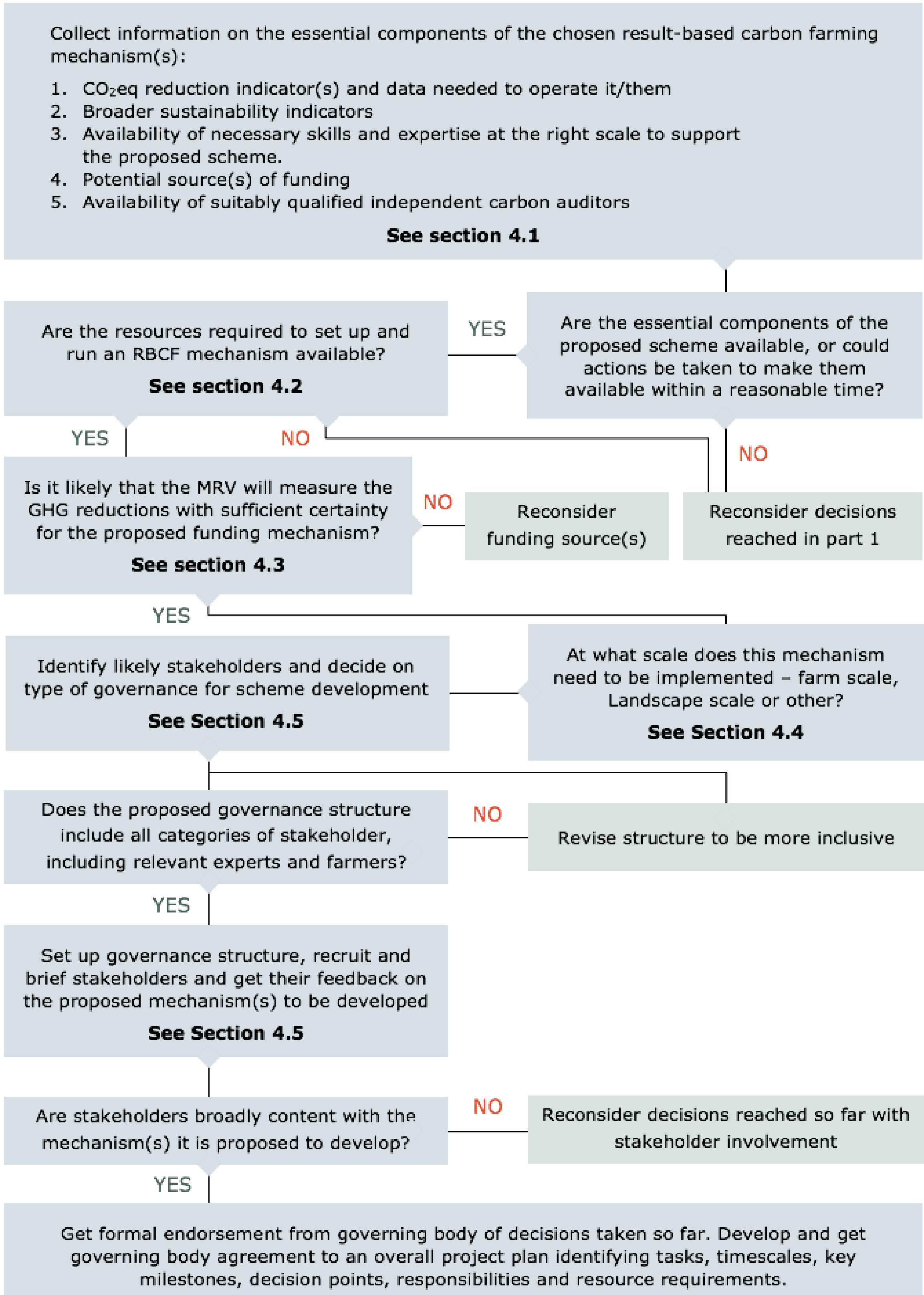
If the initial feasibility assessment identifies a potentially viable result-based carbon farming scheme, then it is worth investing more effort in determining whether or not the essential components of that scheme identified in Chapter 3 already exist, are under development or could be developed within the time available.

If these components exist or could be easily developed, then the next steps are to explore whether enough resources (including time) are available to develop the scheme, whether the likely MRV system can provide the level of certainty required by the potential funding sources and at what scale the scheme would need to be delivered.

When these steps have been completed, if a decision is then taken to proceed with the development of a result-based scheme, it should be possible to identify the stakeholders who should be involved in the governance of the scheme, and then set up a governance scheme. It is then recommended that the stakeholders are allowed to review the decisions taken so far. Once those decisions have been either endorsed or revised it is time to prepare a detailed project plan for scheme development.

Figure 3 summarises these next steps and provides links to the relevant sections of the Handbook.

Figure 3 Confirming feasibility, setting up governance, and planning scheme development



4.1.1. Essential components of the result-based scheme

Before committing to the development of a result-based carbon farming scheme it is worth re-visiting the essential components of the proposed scheme in a bit more depth than was possible during the initial feasibility study. This section provides guidance on some questions and issues that should be addressed at this stage in the process.

A robust result indicator or set of indicators and the ability to monitor it/them in a cost-effective manner are central to the design of any result-based carbon farming scheme. A set of indicators can include both climate mitigation and co-benefit indicators, but the focus here is on indicators of climate mitigation because this is the main purpose of carbon farming.

a. CO_2eq reduction indicator(s) and data needed to operate these

Initial criteria for identifying a potentially suitable climate mitigation indicator are set out in section 3.3.1. If one or more indicators have been identified that meet these criteria, then at this stage they are worth investigating further. Questions to which it is desirable to find answers include:

Does the potential set of indicators measure the climate mitigation benefit in mtCO_2eq?

It should do so in accordance with current IPCC guidance, respecting the IPCC land categories and using the current IPCC Global Warming Potential (GWP) values relevant to each greenhouse gases, while taking note of any country specific or modelled emission factors.

Does the set of indicators also allow for measurement of the gas-specific impacts of the scheme (i.e. changes in mtCO_2, mtN_2O and mtCH_4)?

The EU is concerned about the impact of GHG emissions over a long period (100 years). Since different gases persist in the atmosphere for different periods, they may have different long-term impacts. Although a powerful greenhouse gas, the majority of atmospheric CH_4 dissipates relatively quickly, whereas CO_2 and N_2O do not.

Does the indicator allow the emission intensity of agricultural output to be measured?

The EU wishes to maintain levels of food production, whilst reducing greenhouse gas emissions, so it is desirable to be able to measure the reduction in CO_2eq per unit of production, as well as the absolute level of reduction.

Can the cost-efficiency of mitigation be measured?

It is desirable to be able to evaluate the cost efficiency of the scheme in terms of €/mtCO_2eq. Ideally, this measurement should include both the costs of implementing the project and any change in income for farmers.

Can the climate mitigation benefits of the scheme be measured at farm level and aggregated?

Farm level measurements are central to any result-based carbon farming scheme, and it is desirable that they can be aggregated to the level of the scheme as a whole, and have a clear relation to regional and Member State level datasets required by the 2014-20 CAP Common Monitoring and Evaluation Framework and the proposed 2021-27 CAP Performance Monitoring and Evaluation Framework.

Are data and any issued credits compatible with national inventories for climate impacts?

National inventories are usually top-down and rely on data sharing and compatibility to be able to recognize and use external project- or scheme-level data in the GHG reporting. Data compatibility is specific to each Member State and system and should be investigated early on. Extensive guidance on the production of national inventories for the Agriculture, Forestry and Other Land Use (AFOLU) sector is available from the IPCC (see for example IPCC 2019b), including detailed guidance on cropland, grassland, wetland emissions from livestock and manure management, N_2O emissions from managed soils and CO_2 emissions from lime and urea applications.

Can any direct measurements needed at the farm level be done cheaply and reliably?

It is not often possible to directly measure changes in GHG emission at farm or land parcel level in a way that is cost-effective, so models are often used to convert measurements that can be made at farm level to changes in GHG emissions or carbon sequestration. It is important that any farm level measurements that are needed, for example the area over which management has been changed, or changes in levels of inputs, can be done cheaply and reliably and without unrealistic expectations of the farmers or their advisers. Such measurements may be done in the field, but the potential of remote sensing technology to supply these measurements is worth investigating.

How much time farmers will be prepared to use to measure and record the data required to calculate changes in GHG emissions will be influenced by many factors, including how much they are being paid. An unpublished study of farmers participating in a result-based biodiversity conservation pilots in the UK suggests that any time commitment greater than a total of one week per year is likely to be an obstacle to their participation.

How accurate, consistent, relevant and reliable are the models used to estimate changes in GHG emissions and sinks?

Where (as is often the case) direct measurement of changes in GHG emissions is not practical, then it is vital that the models used to convert the indirect or proxy measures to emission or sequestration impacts are consistent, reliable and have been calibrated and/or ground-truthed for the context in which they will be used. Modelling will almost always involve a compromise between certainty and cost. The quality of the data fed into the model and how accurately the model reflects conditions on each participating farm (granularity) will in large part determine the level of uncertainty in the results it produces. This may in turn affect the types of funding that it is possible to use.

What information is available on inter-annual variability?

One of the criteria set out in section 3.3.3 was the likelihood that the indicator would be influenced by external factors. One good indication of this is the extent to which the measurements vary from year to year in ways that are not obviously connected to changes in management. The IPCC guidelines (IPCC 2019b) point out that variations in weather can have a major impact on many of the indicators used for the AFOLU sector. As already pointed out, the extent to which the indicator varies for reasons beyond a farmer's control largely determines the level of risk to which they are exposed in a result-based scheme and this in turn is likely to impact on levels of uptake.

b. Co-benefit indicators

Some information on the potential co-benefits and any possible adverse impacts of the carbon farming scheme will have been gathered at the feasibility stage (see section 3.3.2). At this stage it is worth considering whether it is practical to extend the result-based approach to the co-benefits, or to assure these in other ways. For example, the scheme could be designed in a way that minimises negative externalities, eligibility requirements or conditions could be placed on participants, or the scheme could be linked to a separate scheme focused on co-benefits, such as biodiversity.

Many of the same considerations applying to climate mitigation indicators also apply to broader sustainability indicators.

Not all result-based carbon farming schemes reward co-benefits, and it is worth considering the advantages of doing so (directly rewarding a wider range of benefits) and the disadvantages (increased costs and/or complexity). The carbon farming schemes mentioned in this Handbook, including the case-studies, have taken a variety of approaches.

c. Monitoring structures

In a result-based carbon farming scheme, the indicator(s) are central to the overall monitoring structure, but there are other factors to consider when deciding whether there is a robust system for monitoring results. These are listed below:

Is there a robust set of procedures for measuring and/or calculating the indicator values and the reduction/removal of GHG emissions?

This relates to, amongst other things, the data sources to be used in a particular location, the baseline to be used and the timing and frequency of sampling.

Is there a standardised system of reporting?

This is important both to ensure that farm level results can be aggregated and that result-based payments can be made in a timely manner.

Is there a means of monitoring the level of uncertainty in the methodology used to calculate the reduction/removal of emissions?

This is likely to require a separate and probably more complex protocol, designed to be used on a subsample of agreements, with more emphasis on direct measurement of GHG reductions/removals.

Is there a means of monitoring the level of 'carbon leakage' within the scheme?

This needs to cover both the possible carbon leakage within farms participating in the scheme and to farms outside the scheme, including those outside the EU.

Is there a robust system for independently verifying the GHG reduction/removal resulting from the scheme?

This is important both for ensuring that the money paid to individual farmers has not been wasted and for evaluating the overall effectiveness and cost of the scheme.

Can the monitoring system be carried out without involving either farmers or the bodies operating the scheme in excessive costs?

Self-assessment by farmers has a number of potential advantages:

- It is generally cheaper than hiring experts to do the monitoring
- It engages farmers more directly in the purpose of their management activities
- It enables farmers to monitor their own progress and get direct feedback on how well their management is working

Self-assessment does however require a monitoring system that is neither so burdensome nor so complex that it acts as a deterrent to participation. Transferring some or all of the complexity and/or cost to the managing body may help with participation rates, but the impact on cost-effectiveness needs to be taken into account. Self-assessment may also lead to a greater risk of error and/or deliberate inflation of the climate mitigation benefits, so a more robust and extensive system of auditing may be needed.

Are suitable existing indicators and monitoring structures available?

It can be seen that fully evaluating from scratch a system of indicators and developing a monitoring system around it is a complex task. This can be considerably simplified if there is an existing system that can be applied to the scheme. Research for this study identified a number of monitoring systems in operation around the world, but not all are directly transferable to a European context. The five case studies from within Europe offer a range of different models, not all of which are yet fully developed (see Chapter 8 and COWI et al., 2021).

Whilst there is a range of indicators and monitoring systems either under development or in use in small-scale schemes, the only types of carbon farming for which there are monitoring systems that could currently be scaled up are peatland-rewetting and agroforestry. However, even these have limitations.

The indicators and monitoring systems applicable to agroforestry do not capture the climate mitigation benefits from increased soil carbon. For both peatland rewetting and agroforestry, local knowledge and locally appropriate data would be needed before the monitoring indicators and systems could be adapted for use in new or wider areas.

If there is no ready-made monitoring system, then securing the resources and expertise needed to develop a potential indicator into a cost-effective monitoring system must be an early priority.

4.1.2. Skills and expertise

A lesson from the result-based schemes aimed at the conservation of biodiversity is that, to succeed, those developing and administering the schemes must have access to people with the necessary skills and expertise, and that farmers need a great deal of support and advice in order to successfully participate in these schemes.

Developing a result-based carbon farming scheme is likely to require policy makers to have input from those with expertise in climate science, different farming systems, economics, social science, EU and Member State rules and systems, IT systems, as well as those able to advise on the environmental co-benefits, including the conservation of biodiversity, catchment and flood management, landscape character etc.

Any effective system of MRV will also need to be informed and preferably run by people with the appropriate knowledge. The current generation of action-based agri-environment schemes in the UK has, for example, been heavily criticised for taking a 'box ticking' approach to inspection and control, which is widely seen as counterproductive. This would be completely inappropriate for a result-based scheme, and it is vital that the MRV system is run by those who understand the results that the scheme is intended to produce. Both the peatland re-wetting and the SOC case studies recommended that training for individuals, accredited entities or companies performing validation and verification should be a priority.

Developing a result-based carbon farming scheme will require policy makers to assemble a multidisciplinary team. Early thought will also need to be given to how the MRV system will be run and how those given the task can be appropriately trained.

There is good evidence that most farmers participating in an environmental land management scheme, particularly those that are result-based, value advice from an appropriately qualified adviser with whom they can build trust over time[8]. Although it is not easy to directly correlate advice provision with outcome, there is evidence that outcomes are positively correlated with the level of farmer knowledge of environmental land management. Such advice provision is a major cost, but vital to the success of the scheme.

Different schemes will require advisers to have different areas of expertise. Even within one scheme a range of knowledge and skills may be needed. For example, the needs of a farmer seeking to restore an existing agroforestry system of high nature and cultural value are very different from those of an arable farmer seeking to introduce a specialised timber crop in an alley-cropping system. For this reason, these two types of farmers will need different kinds of advice on agroforestry.

Specialised one-to-one advice to farmers is resource intensive. It is important not just to investigate whether the money will be available to pay for the required level of advice, but also whether the capacity exists, or could be developed to provide one-to-one advice to all farmers participating in a large scale scheme. There may well not be enough existing, suitably qualified advisers to service more than a small-scale pilot. Sufficient training for intermediaries, advisers and consultants must be an early

[8] See for example: Boatman et al. (2014) and the reports on result-based pilot projects in the UK and Ireland financed via the European Commission (Chaplin et al., 2019; Maher et al.,2018; Byrne et al., 2018)

priority for scheme design. Early thought will need to be given to how that capacity could be increased, perhaps in discussion with the relevant professional bodies.

Adequate provision of advice to farmers, preferably through one-to-one advice from a trusted and suitably qualified adviser is very important for the success of any environmental land management scheme, and particularly for those that are result-based. Securing the funding for the required level of advice and planning to develop the required advisory capacity should be an early priority in the development of a scheme.

4.1.3. Expected attitude of the target farming community

It has been shown that result-based schemes have greater potential than action-based schemes to engage farmers with environmental land management, but there are likely to be some significant barriers to overcome before a result-based scheme is widely taken up by the farming community.

Growing public pressure as well as the impacts that farmers already experience from changing climatic conditions and extreme events have sensitised many farmers to the need to act, and several projects indicate that the interest of farmers is high. However, experience from both outside and within the EU suggests that result-based carbon farming schemes are likely to be met with initial reluctance and scepticism from farmers. There are a number of causes for this. Those identified by the case study on managing SOC on grasslands (COWI et al., 2021 Annex V) included the unfamiliarity of the concept and a lack of the necessary technical knowledge, the perceived complexity of the scheme, the likelihood of high transaction costs and the perceived risk that external factors might prevent the farmer’s actions translating into the desired results, and hence put receipt of the payments at risk. The case study on maintaining and enhancing SOC in mineral soils identified the level of perceived risk as a key factor.

The agroforestry case study concluded that agroforestry would be a significant change for many farmers, especially those with no previous experience of woodland management and that this could be a major barrier to uptake.

Several of the case studies (agroforestry, peatland restoration and rewetting, and maintaining and enhancing SOC in mineral soils) recommended farmer engagement early in the process to allay suspicion, address perceived barriers to uptake and ensure farmer acceptability and uptake of the scheme. This engagement should continue throughout the design process and farmers should also be regularly consulted throughout the operation of the scheme.

The attitude of the farming community to any proposed carbon farming scheme is likely to be at best sceptical when it is first proposed. Experience has shown that if farmers are and/or their representatives are involved in the development of the scheme from an early stage, initial scepticism and resistance can be overcome. A result-based approach can lead to deeper farmer engagement with the management of their land to achieve environmental outcomes.

4.1.4. Potential sources of funding

One factor that distinguishes carbon-based farming schemes from the more well-established result-based biodiversity schemes is the potential for the scheme to be funded by the **carbon market**. The majority of the non-EU schemes reviewed in the initial research for this study derive their funding from the ability to sell carbon credits on either the compliance or voluntary markets. Credits are issued by a registry after the results are monitored and verified. The credits can be sold either as fungible emissions offset credits or (non-tradeable) emissions reduction certificates.

These funding methods have the obvious benefits that the costs of mitigation are borne by a party other than the scheme designer and operator (i.e. by credit/certificate buyers). Some of the schemes reviewed in the case studies also use these sources of funding, but at least two obtain private sector funding as part of a company's supply chain management system (see Box 12 and Box 13) or as part of efforts to offset climate impact by private organisations (e.g. banks or individuals).

Public funding is the other major source worth considering in an EU context. The CAP 2014-20 has funded a wide range of environmental land management schemes through Pillar 2 Rural Development Programmes, including some result-based payments for biodiversity, using the agri-environment-climate measure[9], or through EIP-Agri Operational Groups under the co-operation measures[10]. These instruments are designed to create incentive-based voluntary schemes for farmers and/or other land managers. Additionally, the LEADER and community-led local development measures under Pillar 2 offer opportunities to develop bottom-up or area based carbon farming initiatives, including pilot schemes. Although no examples of LEADER-funded result-based projects were found during the research for the case studies, the potential of this funding mechanism should not be ignored. The European Network for Rural Development has a database of projects funded through LEADER[11], which includes a number focused on climate change mitigation.

Under the proposed CAP 2021-27 these and other rural development interventions, including Agricultural Knowledge and Innovation Systems (AKIS) will continue to be funded by the European Agricultural Fund for Rural Development (EAFRD), and Member States will have more choices available to them to encourage carbon farming, through the use of Pillar 1 interventions and eligibility rules. See section 5.1.1 for further discussion of the opportunities of proposed CAP 2021-27[12].

The other major source of EU funding is the LIFE programme, the EU's funding instrument for the environment and climate action. This provides smaller-scale funding than CAP, but it has a climate action sub-programme that provides grants for best practice, pilot and demonstration projects that contribute to the reduction of greenhouse gas emissions, the implementation and development of EU policy and law, best practices and solutions[13].

Additional national and regional sources of public finding are also available in some Member States. **One of the key factors likely to guide the choice of available funding sources** is the stringency requirements that the source of funding places on the system of MRV. This issue is explored further in section 0.

[9] For more information on these see https://ec.europa.eu/environment/nature/rbaps/index_en.htm

[10] See for example, DAFM (2019)

[11] European Network for Rural Development website: https://enrd.ec.europa.eu/projects-practice_en. Accessed 20/08/2020

[12] References to CAP legislation for the 2021-27 are based on the proposed legislative text COM/2018/392 final - 2018/0216 (COD)

[13] European Commission website- LIFE - Climate action sub-programme https://ec.europa.eu/easme/en/section/life/life-climate-action-sub-programme accessed 11/08/2020

4.1.5. Availability of independent carbon auditors

Any scheme where the intention is to sell carbon credits on either the compliance or voluntary markets is likely to need a system of carbon audits to ensure the integrity of those credits. In many of the existing schemes reviewed by the case studies, including the well-established MoorFutures project, this audit function is carried out by the organisation that undertakes the monitoring (see Annex I). This has cost advantages and seems to be increasingly accepted by some international standard-setting bodies. There are also advantages in integrating the audit function with the advice, as is done within the CarboCage project that was reviewed for the agroforestry case study (Annex II), and the Burren Project in Ireland that was reviewed for the case study on managing SOC on grasslands (Annex VI). National frameworks for certification (e.g. Label Bas Carbon) already play a role, and the anticipated EU certification framework will be a significant step forward[14].

A fully independent audit does however have clear advantages when seeking to convince potential buyers of the integrity of the credits, and it is a requirement under the ‘Gold Standard’ system for assuring carbon offset credits. This system is run by a non-profit foundation and has been operating since 2003. Under this system projects must be verified by a third-party auditor within the first two years of the project and then at five-year intervals. The cost is in the order of €30-40,000 per verification, with an additional €1,500 for a SustainCert review.

> There are a number of bodies that offer an independent audit for schemes producing carbon credits. Particularly if the intention is to sell fungible offset credits, it is worthwhile exploring the costs and likely availability of carbon auditors at this stage.

4.2. Resources and time required

Before committing to the development of a result-based carbon farming scheme, it is important to secure adequate resources to both develop and run the scheme and to allow adequate time for the development process. Setting up and running any environmental land management scheme, and particularly a result-based carbon farming scheme, is likely to require a sizeable, multidisciplinary team. In addition, it may require several organisations to work in partnership, it will require substantial levels of funding, including a long period of investment before there is any possibility of a return, and it will take time.

The agroforestry case-study (Annex II) has identified some of the key elements of institutional capacity needed to establish and run a successful scheme. This are summarised in Box 5.

To help with the process of securing the necessary resources, some of the major resource needs are explored further in this section, although it is worth noting that there is no neat ready reckoner available. Resources covered include expertise and knowledge, partnerships, resources for MRV and audit, other set-up and running costs. The section concludes with the timescale required to develop a result-based carbon farming scheme.

[14] This will be supported by 2020-2022 Commission research project CLIMA/2020/OP/0006, “Support on devising a carbon removal certification mechanism”

Box 5 Institutional capacities needed to deliver a successful result-based carbon farming scheme

Gathering and analysing the data to develop a regional/local knowledge base, and to provide mechanisms which can feed this information into future scheme design
Integrating of stakeholders into the design process and using their knowledge to support scheme development
Management and IT infrastructure for technical support throughout the scheme, structured to interact with key monitoring and advisory windows
Enhancing the role of advisers and upskilling them to cover technical and economic aspects of agroforestry at farm level
Providing or overseeing traceability and links to trusted standards/organisations

Source: COWI et al., 2021 (Annex II)

4.2.1. Expertise and knowledge

a. For scheme development

Having adequate institutional capacity in the body developing the scheme is a key factor in determining the ability of that body to deliver a robust scheme, as shown in several case studies (see the Annexes).

The need to involve people with a range of different skills was briefly covered in section 3.3.5. The need for people with expertise in climate science, the particular farming system being targeted and the economics of farming and carbon offsetting is fairly self-evident, but bodies considering the development of a result-based carbon farming scheme also need to ensure that experts in IT system development are fully integrated into the development team. Experience has shown failure to do this has had adverse consequences for the functioning of some of the existing environmental land management schemes. For result-based schemes the involvement of experts in social science is also recommended. Farmer attitudes and values are often major obstacles to successful scheme development. It is important to understand these and find ways of developing schemes that work with, rather than against, the grain of these deep-rooted attitudes and values. This is covered in more detail section 0.

b. For scheme operation

The skills and capacity that will be needed to run the scheme may also need to be developed in parallel with the scheme design. Section 3.3.5 emphasised the importance of providing farmers with good-quality advice from a trusted source. There are very unlikely to be adequate numbers of suitably qualified 'ready-made' advisers, so the scheme operator will also have to train advisers or consultants. This could be a significant bottleneck and should thus be an early priority when considering the resource needs for scheme development.

Farmers may be prepared to meet some of that cost themselves, but having to pay for advice, particularly when those costs are high, can be a major deterrent to participation.

It is important that all those who will be involved in scheme operation, whatever their particular role, need to have an understanding of the carbon farming system involved, and this is also likely to require continued investment in training.

4.2.2. Partnerships

It is not always possible to develop the full range of institutional capacities needed to design and run a successful scheme within one organisation, and most of the schemes reviewed have been developed by partnerships.

Projects aimed at setting up a result-based carbon farming schemes should seek to involve several parties that fulfil complementary roles (see the case study on managing and enhancing SOC in mineral soils):

- an organisation that takes responsibility of the overall coordination of the project;
- an advisory branch that recruits farmers and accompanies them in developing the management strategy for their farm;
- an auditing / monitoring branch that takes the samples and monitors the results;
- a scientific partner that provides guidance on the use of appropriate sampling protocols and supporting potential estimates;
- one or more funding partners that provide funding for project development, and depending on the payment scheme, also the financing for farm payments;
- advisory parties to the project (for example, farmers' groups or environmental stakeholders).

An example of a public private partnership reviewed for the case study on managing and enhancing SOC in mineral soils is shown in Box 6.

Box 6 Project partnership example – Ebenrain project, Switzerland

The project is a partnership coordinated by the Ebenrain Technical Centre for Agriculture, Nature and Nutrition, a public agricultural authority in the canton Basel-Lanschaft in the NW of Switzerland. The partnership involves the collaboration of the Ebenrain Technical Centre, a subsidiary of Bio-Northwest (a Bio-Suisse member) and Research Institute of Organic Agriculture (FiBL). The financing for the project comes from the Basellandschaftliche Kantonalbank (BLKB), a Swiss regional bank, and to a limited extent from the Canton government. The BLKB provides funding for the payments to the farmers as well as covering two of the three sampling procedures. The Cantonal government funds the coordinator of the project and the advisory component. Starting in 2019, BLKB approached the Ebenrain Centre to develop a pilot project for result-based payments for farmers. The BLKB was looking to offset some of their emissions by supporting a regionally-based project. The motivation for the Ebenrain Centre was to develop a result-based scheme that included clear monitoring of the environmental effects and also addressed the increasing water scarcity conditions in the region. The experiences and knowledge gained from the project would flow into the advisory services offered to farmers more broadly. The FiBL provides scientific guidance for the development of the sampling methodology, and the Agroscope has supported the choice of the analysis method.

Source: COWI et al., 2021 (Annex III)

4.2.3. Costs of MRV and audit

Developing and running the MRV system is likely to be the biggest single cost for a result-based carbon farming scheme. The greater the degree of precision required, the greater the cost is likely to be.

Developing a system of MRV from scratch can be very expensive, depending on the amount of research needed. If no proven indicators exist, then there is also a risk that this will not be possible. In these cases, it would be sensible to keep open the possibility of developing an action-based scheme instead.

Monitoring, reporting and auditing are all likely to require substantial funding throughout the life of the scheme. If an external verifying authority is involved in the audit, then their costs also need to be taken into account.

As an example, the costs of compliance with the Gold Standard system described in section 4.1.5 are set out in Table 3.

Table 3 Gold Standard system charges

Item	Amount	Comments
Methodology approval (new method	€50,000	Takes about 5 months
Methodology (existing method, previously approved elsewhere)	€7,500	Takes about 2 months
Certification (desk review)	€5,000	
Certification (audit)	€30-40,000	
Verification	€30-40,000	Required within two years of the start of the project and then every five years
Verification review	€1,500	
Registry – opening account	€1,000	
Registry - charge per credit sold	€0.30	

Source: COWI et al., 2021 (Annex III)

Although not insignificant, these costs are likely to be a fairly small proportion of the total cost of developing and running an MRV system.

4.2.4. Other set-up costs

Apart from the cost of developing and testing the MRV system and recruiting and paying the development team, there are many other aspects of scheme development that will need to be budgeted for. These include (see the peatland case-study for more details):

- stakeholder consultation exercises;

- baseline setting;
- training;
- publicity and media management;
- production of guidance material, handbooks and manuals for those participating in and running the scheme.

For larger schemes, particularly those funded through the CAP with its complex system of cross-checks and land eligibility rules, bespoke IT systems may be needed to run them. The development costs of such systems can be very high. Off-the-peg systems are available, but great care is needed when assessing their suitability for a particular scheme.

4.2.5. Other running costs

The most obvious running cost is that of rewarding farmers for the GHG emission reductions or carbon sequestration that they achieve through their management. The cost of the management, and hence the cost of the reward, can vary greatly. With some forms of carbon farming, especially those focusing on resource efficiency or improvements to livestock management, there may be productivity benefits and the additional cost may be small, or even negative. In other cases, it can be substantial. Peatland re-wetting and restoration is an example. Peatland restoration costs differ significantly between the restoration of upland peatland (around €4,900/ha on average) and lowland peatland (around €6,240/ha) (Committee on Climate Change, 2020), but farmers may suffer a continuing loss of income (i.e. an opportunity cost) too, especially if the re-wetting makes the land ineligible for CAP Pillar 1 direct payments.

The cost of peatland re-wetting (not restoration) could be substantially reduced if it were possible to use paludiculture to ensure that rewetted peatlands remained in production. Paludiculture has yet to be widely applied in Europe and it faces a number of legal, regulatory and financial obstacles, of which the eligibility of rewetted peat for CAP Pillar 1 payments is one example (more information can be found in the peatland case-study, Annex I).

Aside from payments to farmers, staff costs and the cost of contractors are also likely to be substantial. Finally, there are likely to be other ongoing costs including those for administration, IT and communication.

4.2.6. Timescale

Developing any scheme takes a considerable time. Normally, even when an existing concept is being applied in a new area, this requires piloting and readjusting to the new conditions. As future schemes can learn from and build on existing tools and schemes, they may be able to move faster, especially if they too can leverage existing relationships.

At present, however, experience shows that scheme development takes at least two years and this depends on the project developer being able to draw on pre-existing scientific work.

Development and testing of a system of MRV is generally the most time-consuming element of result-based carbon farming and, when started from zero, can take several years.

It is important that farmers and other stakeholders are consulted about and involved in the process of scheme development. Key stakeholders can be directly involved in the governance, but if wider public consultations are required then the time needed to prepare the consultation document, for stakeholders to respond and for the responses to be analysed can be substantial. Six months would not be an unreasonable timescale for a consultation, with a twelve-week window for stakeholders to submit responses.

Another aspect that may be less immediately obvious is the time needed to recruit farmers to a scheme. Although growing recognition of the climate emergency and the incentives offered by a result-based scheme is likely to raise farmers' interest, the new knowledge and skills that they will need to acquire and implement take time to learn. Schemes should therefore build in training and advisory opportunities that facilitate farmer learning, including peer-to-peer learning. Such training and advice is vital if farmers are to have the confidence to join the scheme.

Where public authorities and existing advisory services are participating in the project, this can be more straightforward, but it will still take time, and it will possibly need to be carried out in stages. Depending on the capacities and the extent of interaction with advisory support, this type of on-boarding can take from a few months to more than a year.

In the Ebenrain project, for example, farmer recruitment began in late 2019 and took several months. By February 2020, the project had achieved 60% of its target area and the first sampling is planned for autumn 2020. In the case of Arla Foods, it took six months, large financial incentives and the involvement of existing consultant networks to recruit 8000 dairy farmers to their Climate Check programme.

Time lags of this nature are particularly important to plan for in publicly-funded schemes, where money is often tied to a particular year. If a scheme is not able to recruit farmers when planned, the total amount of money available to pay them may be reduced.

Key messages on resources:

Setting up and running a result-based carbon farming scheme is likely to require very considerable resources, including a multi-disciplinary team, a partnership of organisations, an adequate budget and considerable time.

Experience suggests that the minimum time to develop and launch a scheme is two years.

Advice and support to farmers is critical and early investment in adviser training and capacity building should be considered.

The most resource-intensive part of the process is the development of the MRV system, including the climate mitigation indicator(s). If these have to be developed from scratch, the cost will be greater, the process is likely to take longer, and the risk of failure is higher.

4.3. The relationship between the funding scheme and MRV

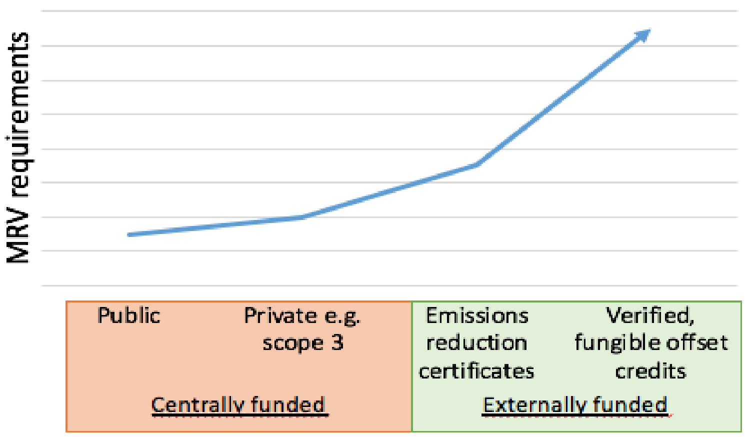
The potential sources of funding reviewed in section 4.1.4 include the selling of tradable offset credits and voluntary offsets, private funding from food sector businesses as part of their supply chain management system and a variety of public funding sources administered by the EU, Member States and regions. One key factor already mentioned is the degree of stringency with which the MRV system can measure the net carbon saving produced by the farmer's actions. This is explored further in this section.

The requirements for fungible emissions offset credits are extremely stringent. The 'Gold Standard' offset management system[15], for example, requires scheme developers to first have their methodology approved , then obtain a scheme certification from an independent reviewer and finally to submit to regular cycles of third-party verification.

The requirements for voluntary emission reduction credits can be rather less stringent. The requirements for private company supply chain and publicly funded schemes are at the discretion of the body developing the scheme, but are usually rather more relaxed.

The relationship between MRV requirements and funding source is illustrated in Figure 4. Generally, it can be concluded that MRV requirements are higher the greater the distance between the regulator of carbon removals/reductions (the scheme administrator) and the user (the purchaser or funder).

Figure 4 MRV requirements under different funding options



Source: COWI et al., 2021 (Annex IV)

In an EU context, the other key consideration in relation to the fungibility of offset credits is whether the type of carbon credit and the activity for which the offset is being purchased are compliant with EU rules designed to ensure compliance with international standards and avoid double counting.

[15] See the GoldUStandard website *https://www.goldstandard.org/take-action/offset-your-emissions accessed 12/08/2020*

These rules are complex, but in general terms exchange of credits between sectors and between Member States complicates matters. Also, under current rules, use of credits from managed forest land outside of the LULUCF sector in the issuer country adds complexity and needs careful consideration and coordination with the authority responsible for LULUCF accounting. The analytical work for this study (COWI et al., 2020) concludes that these two constraints limit the demand for carbon farming credits and are major barriers for implementation at the EU scale.

Other factors to be considered include the security and predictability of the payment scheme. COWI et al. (2020) has also shown that existing schemes have obtained hugely different prices for carbon credits, particularly those relying on voluntary emission reduction credits. Markets are also subject to price fluctuations over time, so there may be no guarantee that farmers will receive the payment they are expecting.

Schemes funded by a private company depend of course on the continued commitment and prosperity of that company. Payments from publicly funded schemes are generally secure once they have been agreed, but may be discontinued or altered as public policy evolves.

The CAP is potentially a relatively stable source of funding for result-based carbon farming and it should be possible to fund multi-annual agreements under both pillars of the CAP post 2020. Schemes designed to benefit from CAP funding will need to comply with rules on conditionality and eligibility requirements proposed to underpin the 'green architecture' of the 2021-27 CAP. Despite their relative stability, schemes funded by the CAP are subject to the seven-year policy cycle of the CAP, with funding levels, regulations and priorities all liable to change between cycles.

EU LIFE projects all have a fixed duration, and for this reason they are not suitable for funding ongoing schemes, but are again a potentially useful form of funding for developing innovative schemes or new methodologies.

A key advantage of schemes that operate using public funds is that they do not rely on the principle of offsetting, but can offer absolute reductions in net GHG emissions.

Key factors to consider when reviewing the potential availability of funding sources are:

- How stringent can the MRV system be made, without incurring excessive costs? The more stringent it is, the wider the choice of funding systems.
- How willing are farmers and scheme organisers to accept uncertainty in the levels of payment? Relying on markets, particularly on the voluntary markets, means that the price received by the farmer may vary, unless the scheme organiser offers a price guarantee.
- Market funding is tied to the trading of offsets. If the scheme developers do not wish to engage with this, then public funding is probably the best option.
- Can the scheme be designed to operate within CAP rules and integrated into a CAP Strategic Plan? If it can, using CAP funds can potentially provide access to quite a substantial and relatively stable source of funding.
- Is the scheme innovative or experimental? Can it be used to develop methodologies that can later be applied more widely? If so, it may be worth considering LIFE funding, but being aware that this is always time-limited and will require co-funding.

4.4. Scale of implementation

Decisions on scale of implementation will need to factor in both administrative and biogeographic factors. If a scheme is, for example, being proposed by a Member State or by a region, that will immediately set limits on potential coverage. Biogeographic factors can however also be important. Some mitigation actions, such as those involving livestock management, will be applicable to very large numbers of agricultural holdings over a wide area. Other actions, such as the re-wetting of peatlands or the restoration of wetlands, will always be localised and will need to be very carefully targeted.

Other things being equal, a scheme that is applicable to a widespread farming system or practice will have greater potential to deliver climate mitigation benefits, even if the benefits per unit area are modest.

A highly targeted scheme applicable to only a small area of land may still be worth considering if the climate mitigation benefits per unit area are large.

In the case of schemes aimed at a widespread farming system or practice, one factor that can limit the scale at which they can operate is the scope of the farm carbon audit tool to robustly measure emissions. Most carbon audit tools can only measure emissions for certain types of farms and/or climate actions, and usually only in a particular geographic context.

In recent years there has been a move to encourage the uptake of environmental land management schemes at landscape or catchment scale, rather than farm-by-farm. Apart from the obvious benefits of the increased scale, this also allows the management to be more consistent and to be optimally targeted to the landscape.

In the case of carbon farming schemes, where the aim is to reduce global GHG emissions, some of the considerations that apply to schemes aimed at conserving biodiversity or managing water resources may be less important, though they may still be important for the delivery of co-benefits. Landscape scale implementation may however still have advantages, including reducing the scope for emission saving carbon leakage through emission displacement between farms in the same area. A disadvantage of landscape-scale implementation is that requiring farmers to collaborate usually requires facilitation, which is an additional cost.

There are some circumstances where there is no alternative to landscape-scale implementation. An example would be a large, drained lowland peatland, where re-wetting would not be feasible unless all the farmers who are potentially affected by the raised water levels agree.

Another factor to consider is what combination of carbon farming and other commitments are applicable at farm level and what a farmer might be prepared or able to take on. To assess this, it is important to understand the farming systems within the area at which the scheme is being targeted. If, for example, the farms in the area are mostly arable, there could be a good uptake of a range of mitigation measures for increasing SOC and perhaps for introducing agroforestry or retaining woody landscape features, but mitigation measures for grasslands are unlikely to be popular. There may be advantages in bundling more than one mitigation measure into a single result-based carbon farming scheme, especially if there is overlap between the measurements needed to monitor the results. The livestock farm carbon audit case study provides an example where the use of a single carbon audit tool is proposed, to estimate and combine the mitigation benefits of a range of livestock and land management practices.

As well as the co-benefits arising from climate mitigation measures, farmers may also be eligible for other environmental land management schemes aimed at conserving biodiversity, preserving cultural heritage, managing water resources or other objectives. It is important that carbon farming schemes can either be integrated with, or can work alongside these other schemes, and that potential duplication and double funding is avoided.

A problem with multi-objective result-based schemes, that has yet to be fully resolved, is how to limit the complexity of the MRV system when multiple indicators for different objectives need to be assessed. In these cases, it may be worth considering a combination of result and action-based schemes, with the result-based scheme used selectively, either where it is likely to produce the greatest benefits, or where the indicators and MRV systems are best developed.

4.5. Scheme governance

Although the role of the scheme owner is very important, it is vital to the success of the scheme to set up an effective system of governance. This section explores some of the lessons learned from the governance of existing result-based carbon-farming schemes and uses these lessons to identify some key questions that bodies considering setting up new schemes should consider, including who to involve and at what stage to set up a formal system of governance.

4.5.1. Governance lessons learned from existing schemes

a. Lessons learned from around the world

The analytical work for this study examined the systems of governance running result-based carbon farming schemes around the world and found a great variety of approaches (COWI et al., 2020). That analysis concludes that there is no one-size-fits-all solution. Schemes can be owned by either public or private bodies, though all the compliance mechanisms examined were owned by public bodies (COWI et al., 2020).

Despite the great variety of approaches, it is possible to identify some common features of the governance systems adopted. COWI et al. (2020) concluded that a number of lessons could be learned from examining the governance structures of the schemes they looked at. These are listed in Box 7.

Box 7 Lessons learned from the study of the governance of result-based carbon farming schemes from around the world

- For schemes operated by more than one owner, a public multi-stakeholder steering committee or board is common, and it is the forum where the operational and development decisions are made. If there is one owner, such committees are not used.
- The advantage of single ownership is the possibility of giving faster operational guidance and clarifications, but the disadvantage is that it allows less involvement of stakeholders.
- For schemes where sectors other than AFOLU are involved, there is a need to mandate an expert working group due to the complexity and particularity of land use sector projects as compared to other sectors.

- The governance systems of all the carbon farming schemes examined rely on having procedures and entities to review and approve at three levels: methodologies, projects and verifiers. Furthermore, to prevent fraud and double-counting, registries of projects and credits are in place in all cases.
- All the market-based carbon farming schemes covered foresee linking with other schemes and achieving cross-scheme fungibility of credits in order to increase possible demand and stable price setting. The approaches taken by the individual schemes represent three different aspects of linking, namely linking, fungibility and consistency in methods. A fourth element would be recognition of credits on demand side, which is not currently the case.
- The recent advent of local voluntary schemes that are initiated and managed by public authorities appeals to companies that want to contribute to climate action beyond offsets and compliance.
- Privately-governed schemes historically acted as testing grounds for methods to be adopted by public schemes. Due to the novelty of carbon farming in the carbon market, this role remains particularly relevant for the agricultural sector and will be further supported if credits from privately-owned schemes become increasingly accepted by public/compliance schemes.
- Public as well as private entities have different advantages and shortcomings related to scheme ownership. For this reason, through public-private partnerships, schemes will profit from a good outreach and innovative approaches, while having secured finance and public support.
- The emergence of smaller and local voluntary markets, as well as producer-retailer-consumer arrangements, bring buyers closer to the mitigation impact and encourages interest in climate action.

Source: COWI et al. (2020)

b. Lessons learned from the European case studies

As shown in the five case studies, there is no one-size-fits-all approach to the governance of result-based carbon farming schemes. They range from the very formal, rigorous systems adopted for some schemes to relatively simple systems of governance adopted by others.

One major determinant of the governance system is whether or not the aim is to sell verified, fungible offset credits. If it is so, the governance structures should allow for a clear separation of roles to ensure efficiency, guarantee the maintenance of standards and avoid corruption. Independent approval from an entity such as 'Gold Standard' is likely to be needed for the methodology, as well as independent certification of the scheme, its independent verification from an organisation such as 'SustainCert' and its periodic re-verification. An independent registry will also be needed.

External verification is also often felt necessary for schemes selling emissions reduction certificates, but in some cases, such as the MoorFutures scheme, internal verification has been chosen and the scheme relies on its reputation to assure purchasers of the validity of the certificates, which cannot be re-sold.

Such relatively simple, flexible governance arrangements are particularly suited to small-scale pioneering projects that do not envisage the need for a major budget. However, where such projects are in receipt of public support, such as from the LIFE programme, governance arrangements are likely to have to be relatively formal.

Examples of relatively simple governance structures come from the MoorFutures and max.moor projects, researched for the peatland case study (Annex I). These are summarised in Box 8.

Box 8 Key features of the governance of the MoorFutures and max.moor projects

Both projects have been driven by a small number of dedicated, competent individuals with specialist expertise in the subject. They have acted as the scheme owners. Governments have played a small, secondary role.

Both projects have steering groups and a separate scientific advisory board, with dedicated terms of reference and regular meetings.

The Moor Futures steering group includes representatives of local government, farmers, NGOs, businesses and research.

Despite the existence of separate scientific advisory boards, both projects regard it as important to have people with scientific knowledge on the steering group.

Governance structures have evolved with the project.

Source: adapted from COWI et al., 2021 (Annex I)

Another major determinant seems to be the nature of the scheme owner. Schemes intended to operate on a large scale and/or those owned by public bodies tend to have more elaborate and formal systems of governance. Those initiated locally through a bottom-up approach may have simpler and less formal governance structures.

There are however exceptions, such as the French '*Label bas Carbone*' scheme, set up by the French Ministry for the Ecological and Inclusive Transition as a public certification scheme for voluntary offsets. This has a public registry and has four approved methodologies including CARBONAGRI, but governance is relatively informal. Methodology approval is an ad-hoc and collaborative process. So far, methods have arisen from existing research projects. The Ministry works with the developer to prepare the method, consulting with experts and stakeholders. The Ministry then convenes an ad-hoc scientific board to help review and approve the methodology. The Ministry may make the process more formal in the future to increase integrity, for example by establishing a separate technical group with independent terms and nominations. It is worth noting that the credits that are produced using the scheme are not fungible i.e. they are project-specific and cannot be resold.

In general, governance should start with an analysis of the key stakeholders, to work out who needs to be involved in the governance structure. Box 9 lists the categories of stakeholder that should be involved in governance.

Box 9 Main categories of stakeholders to involve in the governance of result-based carbon farming schemes

Private sector/public institution / financier - includes government (national, regional, local), civil society organisations, private entities and international bodies involved in funding, implementing and/or overseeing the intervention. These actors are also steering the agri- and climate relevant policies and the carbon market schemes.

Farmers/beneficiaries – could be individual farmers or a collaboration of farmers (groups or organizations) jointly implementing the initiative.

Advisory/Implementing agency – could be a local organization managing and supporting the implementation, for instance by providing advisory services and facilitating or conducting the monitoring of implementation progress.

The research community – is important for filling the knowledge gaps together with the farmers and the implementing agency.

Source: COWI et al., 2021 (Annex V)

It is important that the key stakeholders are all given a meaningful role in the governance structure. Ideally, the design of result-based carbon farming schemes should be developed together with key stakeholders, who should collaborate to identify shared priorities. It may not always be possible to generate the degree of consensus needed for this approach but, as a minimum, the scheme owner should consult with the stakeholders to understand their views and, where it is not possible to reach an agreement, explain why not.

In more formal governance structures, particularly those being set up by public authorities, it is vital that the 'rules of engagement' are agreed with the stakeholders at the start of the process.

Transparency is key to building trust with all stakeholders, especially farmers, policy-makers, and external funders (e.g. credit buyers).

The livestock farm carbon audit case study (Annex IV) emphasises how important it is that the governance system ensures transparency and recommends that a public registry, managed by the scheme operator, should publicly record all non-commercially sensitive results of the scheme. This should include non-anonymised farm-level reporting on results indicators (i.e. emissions reductions achieved) and other sustainability indicators. The overall impact of the scheme should also be calculated based on this data and publicly promoted, for example through a website and promotional material. The scheme should also confidentially store the audit tool input and output data as anonymised data to support scheme development. If emissions reduction certificates or offset credits are sold, the purchaser and purchase amount should be publicly listed on the registry.

Key messages on governance

- There is no one-size-fits-all approach to governance, but generally speaking schemes that aim to sell carbon credits and those accountable for spending significant amounts of public money will need more formal systems of governance.
- Schemes wanting to produce fungible offset credits are likely to need systems of governance that include independent approval of the methodology, certification of the scheme, independent verification, period re-verification and an independent registry.
- For smaller, more experimental schemes and for pilots, less formal governance may be less time consuming and more agile. A steering group and a scientific advisory board are minimum requirements.

- Whatever approach is taken to governance, it is important to identify and involve the key stakeholders (internal and external), and to try to build a consensus with them as to the objectives of the scheme.
- If a co-development approach is feasible then it has advantages, but in any case it is vital that the terms of engagement by stakeholders in the governance of a scheme are agreed at the outset.
- Particularly for schemes owned by public authorities it is important to ensure that governance does not become unnecessarily unwieldy. Multiple lines of reporting should be avoided if possible, as should the direct involvement of people or organisations with little to contribute but who want to be 'kept in the loop'.
- Formal systems of project management impose considerable costs. Such systems can be very useful, but only if all involved accept the level of discipline that such systems need and take deadlines, dependencies, risk registers etc. seriously.

Sources: own compilation based on COWI et al. (2020 and 2021) and own experience[16].

4.5.2. When should governance be formalised?

It is suggested that the body owning the proposed scheme should carry out the investigations described up to this point, before setting up any formal governance structures. However, it is important that it creates a formal governance structure before going any further.

This needs careful consideration. Too early and there is a risk of unrealistic expectations, loss of control and/or stakeholder disillusionment. Too late and stakeholders may suspect that they are just being invited to rubber stamp what has already been decided.

When this is done, the stakeholders involved should be given a chance to review and discuss the work done up to this point and challenge any decisions reached as a result. If serious challenges arise it is important that they are resolved before attempting to make further progress.

4.5.3. Next steps for newly established governing bodies

The first task of the newly established governing body should be to commission, discuss, challenge and eventually approve an outline project plan for the development of the result-based carbon farming scheme. Chapter 5 describes the main areas of work that will need to be covered.

[16] The lead author was involved in setting up and operating the governance of a major government-owned mechanism development project, albeit for a mainly action-based mechanism. Some of his personal experience has been used here.

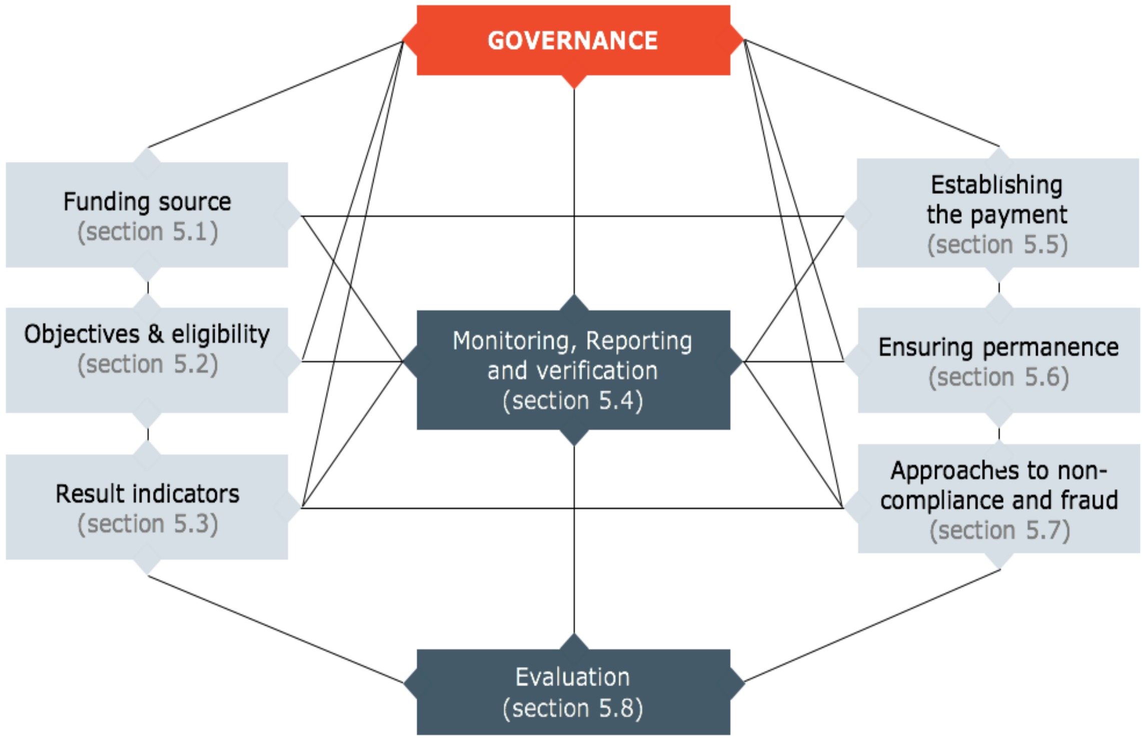
5. Key design elements of a result-based carbon farming scheme

This chapter provides more detailed guidance on scheme development, once it has been determined that a result-based carbon farming scheme is feasible, the availability of the necessary resources has been determined and a governance structure has been put in place. It therefore builds on guidance in Chapters 3 and 4.

In general, the decisions taken in the course of developing one component of a result-based carbon farming scheme are likely to affect the development of others, so the rather linear approach suggested for the early stages of the development process illustrated in Figure 2 and Figure 3 is not appropriate now.

Instead, the major aspects of scheme development covered in this chapter should proceed in parallel, with very frequent and continuing communication between the teams or individuals responsible for each, and with the governance structure maintaining an overview and ensuring coordination. Having said that, the central role of the MRV system in determining what is feasible within a result-based carbon farming scheme needs to be borne in mind and those involved in all other aspects of scheme development need to keep in close touch with the progress of the MRV system and be aware of the decisions being taken. Figure 5 summarises how the development process might be structured.

Figure 5 Development process for a result-based carbon farming scheme



It should be noted, that from 2023 a European Carbon Removals Certification standard should be available, pending preparatory work undertaken by the European Commission and consultants[17]. This framework will clarify how nature-based (including carbon farming) and technology-based removals will be incentivised and integrated into the European climate framework, including in relation to MRV requirements and approaches to deal with non-compliance and fraud.

5.1. Potential sources of funding

An introduction to the various source of potential funding, and their implications for scheme design, was provided in sections 4.1.4. This section considers the CAP and LIFE funding in more detail.

5.1.1. Opportunities from EU financing

The main sources of EU financing were identified in section 4.1.4, here the CAP and LIFE are discussed in more detail.

The proposed CAP 2021-27

In the legislative proposals for the CAP 2021-27[18] Member States are each required to prepare a CAP Strategic Plan (CSP) that encompass the measures within both Pillars of the CAP, including those to deliver climate and environmental needs) within the framework of the new green architecture of the CAP.

The **first step** in preparing a CSP that incentivises uptake of carbon farming is to identify climate mitigation needs within the Member State's broader environmental objectives for the CAP, then address those needs at each decision point in the CSP process, aiming for a joined-up, coherent approach. This may require a regionalised approach if carbon farming needs differ considerably across the Member State.

The key **second step** is aimed at protecting existing carbon resources in soils, permanent grassland, established agroforestry systems and woody landscape features by defining eligibility rules and conditionality standards.

This provides a firm foundation for the **third step** of designing a coherent group of intervention measures in both pillars of the CAP, targeted at carbon farming.

The **fourth step** is to ensure that farmers, their advisers and contractors understand why carbon farming is so important, and how to use available CAP support effectively. This requires using the broad range of measures available to CAP managing authorities to set up specific, specialised sources of information, advice and training for farmers and advisers.

The fifth step is to encourage co-operation and innovation among land managers and others involved in carbon farming by providing funding under the cooperation measure for setting up Carbon Farming Operational Groups. The CSP decision points and choices by Member States that would benefit carbon farming are summarised in Table 4.

[17] EU Commission DG CLIMA project CLIMA/2020/OP/0006 "Support on devising a carbon removal certification mechanism" runs from December 2020-Febuary 2022.
[18] References to CAP legislation for the 2021-27 are based on the proposed legislative text COM/2018/392 final - 2018/0216 (COD)

Table 4 Key choices in CAP Strategic Plan preparation to support carbon farming

CAP Strategic Plan decision point (references are to COM(2018) 392 final)	**Key choices for the benefit of carbon farming**
Needs and SWOT assessment and intervention strategy (Articles 96 and 97)	• identify carbon farming needs and opportunities for different farming systems, soil types and land cover, including drained peatland and existing agroforestry systems • detail how these are to be addressed through the coherent choice of interventions across the whole CAP, as part of the green architecture • identify co-benefits of meeting carbon farming needs (e.g. for biodiversity, soil quality water quality, flood risk management, diversifying income)
Definition of ‘permanent grassland’ and ‘permanent pasture’ (Article 4(b)iii)	• ensure that this definition includes permanent grassland habitats with shrubs and/or trees, including pastoral agroforestry systems
Definition of ‘arable land’ (Article 4(b)i)	• ensure that this definition includes arable agroforestry systems
Conditionality – standards of Good Agricultural and Environmental Condition (GAEC) (Article 11)	• maintain permanent grassland ratio (GAEC 1) • protect wetland and peatland (GAEC 2) • tillage management, protection of soils in winter and crop rotation (GAEC 6, GAEC 7 and GAEC 8) • protect all woody landscape features, wetlands and non-productive areas (GAEC 9) • protect all permanent grassland habitats in Natura 2000 sites (GAEC 10)
Farm Advisory Service and Agricultural Knowledge and Innovation System (Articles 13 and 72)	• ensure that Farm Advisory Services and the wider AKIS system provide up-to-date technical advice on needs/benefits of carbon farming • provide technical training on carbon farming for advisory services (public and private)
Sectoral support (Article 30)	• for paludiculture on rewetted peatland, as a ‘non-food crop used for the production of products that have the potential to substitute fossil fuels’
Eco-schemes	• top-up to basic income support, for agroforestry systems

(Article 28)	• top-up to basic income support, proportional to density of woody landscape features (going beyond requirements set out in GAEC 9) • top-up to basic income support, for rewetted peatland
Environmental management commitments (Article 65)	• result-based pilot schemes for peatland restoration and rewetting • result-based pilot schemes for management of low-intensity traditional agroforestry systems under threat • action-based schemes for SOC in mineral soils and grasslands
Natura 2000 disadvantages (Article 67)	• Natura 2000 compensation payments for permanent grassland, peatland and wetland habitats
Investments in biodiversity, ecosystem services, habitats and landscapes (Articles 68(2) and 6(1)f	• rewetting/restoration of drained peatland • restoration/creation of new woody landscape features • restoration of low-intensity traditional agroforestry systems under threat • creation of new agroforestry systems • conversion of arable to permanent grassland
Cooperation (Article 71)	• set up European Innovation Partnership Operational Groups and/or LEADER initiatives for result-based carbon farming

The European Commission has proposed that eco-schemes could make an important contribution to carbon farming. Detailed description assessment of the potential of eco-schemes can be found in Lampkin et al. (2020) and a summary of their strengths and weaknesses from that report is at Table 5. The annual nature of the commitments would appear to rule out the eco-schemes as a suitable source of funding for multi-annual result-based carbon farming schemes, but they could provide enhanced annual basic payments for farmers who maintain rewetted peatland and agroforestry systems and also for farmland with higher densities of woody landscape features.

Table 5 Strengths and weaknesses of proposed CAP eco-schemes

Strengths	**Weaknesses**
Eco-schemes allow for using the Pillar 1 direct payment budget for achieving environmental and climate objectives in a more targeted way.	Budgetary rules do not allow unspent funds under the European Agricultural Guarantee Fund (EAGF) to be rolled over to the subsequent year if the target uptake value has not been reached, unlike the EAFRD. Legal clarification is needed in order to understand if some flexibility can be applied to the budgetary rules once the unspent funds are used to fund the specific environmental and climate objectives.
Regional programming of Eco-schemes is possible, even if part of national CAP strategic plans.	If too many participants, either Basic or Eco-scheme payments may have to be reduced to respect budgets.
MS have more flexibility in the amount they pay to farmers than with AECM as the payment level may be calculated as a top-up to the income support for sustainability. Payment calculations are not limited to the requirement only to pay incurred costs or income forgone.	Risk of double funding: AECMs can be supported as Pillar 1 Eco-schemes and as AECMs in Pillar 2. Pillar 1 Eco-Schemes should not overlap with Pillar 2 AECMs to avoid double funding, but there is a danger that efforts to mitigate the risk of double funding could negatively impact on complementarity between schemes.
There is a legal right to receive the payment, which means that farmers who want to and are eligible cannot be excluded for budgetary or other reasons.	Environment and climate measures need a long-term perspective to achieve impacts. Annual commitments linked to annual budgets may be ineffective, e.g. for increasing biodiversity, as farmers can drop the measure after one year, but longer-term commitments can be programmed despite budget constraints.
Programming on MS not regional level: opportunity to design measures in a more coherent way (e.g. national support for organic farming, pasture-based ruminant systems, HNV farming etc.)	Eco-schemes and payment rates could change annually. Thus, compared to multiannual commitments, farmers' planning security decreases.
The commitment is normally for one year, which means adoption barriers to farmers may be lower as they can try out Eco-schemes without committing to a multi-annual contract.	As currently proposed, eco-schemes cannot be used for food quality or animal welfare measures, although if they have an environment/climate objective they may be eligible. Discussions are continuing about whether to formally include animal welfare measures in Eco-schemes.
Higher acceptance in agricultural sector as only genuine farmers are eligible as beneficiaries.	Member States' flexibility in scope of design of Eco-schemes could lead to ineffective agri-environment and climate measures (race to the bottom).

Source: Lampkin et al. (2020)

EU LIFE funding

The Climate Action sub-programme of the EU LIFE programme aimed to provide €864 million in co-financing for climate projects between 2014 and 2020. Its main objectives[19] were to:

- Contribute to the shift towards a low-carbon and climate-resilient economy
- Improve the development, implementation and enforcement of EU climate change policy and legislation
- Support better environmental and climate change governance at all levels
- Support the implementation of the 7th Environment Action Programme

This sub-programme supports projects in the areas of renewable energies, energy efficiency, farming, land use, and peatland management. It provides, amongst other things, action grants for best practice, pilot and demonstration projects that contribute to the reduction of greenhouse gas emissions. Examples of LIFE funded carbon-farming projects include the Beef Carbon Action Plan Project (see Box 10) and the Carbon Farming Scheme led by the Baltic Sea Action Group[20].

It can be seen from this example that the LIFE programme has potential to assist with various aspects of the development of result-based carbon farming, including methodology development, development of advisory capacity and partnership building. The Beef Carbon Action Plan Project has contributed to the development of the French CARBON AGRI scheme, described in the case study on livestock farm carbon audit (Annex IV). This illustrates the point that LIFE can be used to develop market-funded schemes as well as those intended for implementation using CAP funding.

Box 10 The Beef Carbon Action Plan Project

This LIFE-funded project is scheduled to run from 2016 to 2020. It involves four partner countries (Italy, Ireland, France and Spain) that together represent 32 per cent of the EU cattle herd and a wide variety of production systems.

The project has been working on the following tasks:

- Developing a common framework for assessing greenhouse gas (GHG) emissions, including assessment tools, and for mitigation practices
- Testing and promoting innovative best practices for reducing GHG emissions and increasing carbon sequestration on beef farms
- Creating a beef carbon farms observatory and a European beef carbon farmers' network
- Developing a shared structure for beef carbon action plans and developing these

[19] LIFE Climate Action, website of the European Commission: https://ec.europa.eu/clima/policies/budget/life_en#:~:text=The%20Climate%20Action%20sub%2Dprogramme,Its%20main%20objectives%20are%20to%3A&text=Improve%20the%20development%2C%20implementation%20and,change%20governance%20at%20all%20levels. Accessed 20/08/2020
[20] https://carbonaction.org/en/life-carbon-farming-scheme-2/(accessed 16 December 2020)

plans for the four participating countries

- Using these strategies to demonstrate to other EU countries and regions and to beef value chains the interest and feasibility of this approach

The expected outcomes from the project are:

- Calculation tools to evaluate beef carbon footprints and help make decisions on management practices
- A set of 170 innovative farms producing beef with a low carbon footprint and a network of 150 advisers
- GHG emission assessments for 2000 representative beef producing farms
- An evaluation of several innovative GHG emission mitigation practices
- An economic and social evaluation of the feasibility of implementing beef carbon action plans
- A 15 per cent reduction in GHG emissions from beef farming

Source: adapted from Beef Carbon Action Plan leaflet (undated)

5.1.2. The role of carbon markets/private actors

Carbon markets will facilitate the development of result-based carbon farming schemes because they provide legitimacy as well as longevity. Carbon markets can be compliance-based, when carbon credits are used to meet binding emission caps and private actors purchase these credits to offset their emissions, or voluntary, where targets are not regulated by a public authority.

In general, voluntary carbon markets have proved to be a valuable way for project developers to enter or initiate a carbon farming scheme that includes soil carbon sequestration. In addition, there are many international examples of voluntary markets to incentivise carbon sequestration in forestry and peatlands. Carbon markets allow for a scheme to be self-perpetuating, but initial funding usually stems from other funding sources.

While carbon markets are a clear avenue for the setting up of a result-based scheme, the effectiveness and long-term price stability of the market depend on proper support from either private or public sources. In the case of compliance markets, demand for carbon credits is created by policies imposing emission reduction targets, i.e. the more ambitious national reduction targets, caps or environmental policies are, the higher the demand from compliance buyers.

The long-term potential for regulatory carbon markets is demonstrated by the Kyoto Protocol's three flexible market mechanisms: Emissions Trading, the Clean Development Scheme (CDM) and Joint Implementation (JI). Since then, other national and international mechanisms have linked to or mimicked these mechanisms, with the CDM specifically providing the backbone to carbon offset mechanisms worldwide. While the Kyoto Protocol's international carbon market has stalled, national or regional mechanisms have been able to continue through lessons learned and now-established carbon markets. However, an international carbon market to continue the Kyoto regime post-2020 is uncertain, with the pending deliberations on Article 6 of the Paris

Agreement. Article 6 contains three separate mechanisms for voluntary cooperation toward climate goals, with two of these based on markets; Article 6.2 allows for bilateral and plurilateral cooperation among countries, and Article 6.4 establishes a Sustainable Development Scheme that is seen as the successor of the CDM.

There are numerous carbon standards that are connected to voluntary carbon markets with differing levels and types of support (public or private). Voluntary markets provide an incentive for landowners to benefit from improving their land management practices to reduce climate emissions or increase carbon sequestration. The existence of voluntary markets in partnership with national requirements for emissions, though, presents the issue of double counting. Double counting can either occur in form of double claiming, i.e. when two or more parties claim the same emission reduction/removal enhancement to comply with their mitigation targets, or in form of double issuance, i.e. when more than one emission reduction unit is registered under different mitigation schemes, e.g. a voluntary scheme and a Nationally Determined Contribution. If the credit is accounted for in two different registries, an overestimation of emission reduction occurs. This is typically combatted through a robust registry system such that the credit is thoroughly tracked to the source and voluntary schemes typically implement strict guidance on avoidance of double counting. The UK Peatland Code has a double counting strategy in place through their strict registration system, which ensures that the credit is properly tracked directly to its owner. The Peatland Code Registry keeps track of ownership such that there can only be one owner at a time of a credit, i.e. until the emissions reduction benefit is sold by the landowner, it belongs solely to that landowner. Emission reduction units are also only sold within the United Kingdom, avoiding the potential for double-counting across countries (Von Unger et al., 2019).

Projects that are jointly funded by public and private actors are increasingly common. For projects with such 'blended' finance it is important to ensure, in grant agreements, credit purchase agreements or loans, which partner assumes the right to the mitigation outcomes, including any co-benefits not monetised as part of the credit itself. In early years of scheme development, revenue from credit sales alone most likely cannot cover capacity costs, meaning some sources of financing will have to accept no ownership. For example, the peatland restoration scheme max.moor includes public start up financing to cover establishment costs, which are not directly recouped from credit sales. As in-kind support to avoid double counting, the Swiss authorities furthermore retires one CDM credit for each credit issued by max.moor. These CDM credits are called 'shadow' credits that, when cancelled, help to prevent investors complying twice with the same credit[21].

In setting up as well as operating a scheme, the combination of actors from a broad range of institutions can establish a well-rounded scheme that combines the public and private sectors. By linking with the public sector, there is potential for price support and broader connections to the carbon market and national/international trading schemes. For example, the case study on peatland restoration and rewetting (Annex I) found that most peatland schemes had their genesis through a small group of experts and took lessons learned from the experiences of previous carbon farming schemes. Operating the scheme typically involves the collaboration between two sets of groups, namely the steering group made up of local government, farmers, NGOs,

[21] Future of the Voluntary Carbon Markets in the Light of the Paris Agreement. Available at: https://www.dehst.de/SharedDocs/downloads/EN/project-mechanisms/moorstandards_studie.pdf?__blob=publicationFile&v=2

businesses and researchers and an advisory group handling the methodology and data oversight. MoorFutures has been in operation long enough to offer significant insight into the sustainability of a peatland scheme as a result of strong cross-collaboration between types of operators (see Box 11).

Box 11 MoorFutures operational set-up

MoorFutures began through a small consortium of peatland experts from the University of Greifswald and took many years to finally be in operation. Through lessons from other schemes and specialists (e.g. VCS (Verra), IPCC Guidance experts, KP negotiators) the team explored how a carbon market could reduce upfront costs of the scheme. MoorFutures is headed by and continuously supported by the initial steering group of scientists and all relevant changes to methodologies or decision must be approved by this steering group. Regular meetings across the different groups (scientists, the regional government, farmers, etc.) has safeguarded the research-based approach to the scheme as well as a system of checks and balances that ensures that decisions always go through a consultation process, enabling farmers as well as operators to influence scheme changes or decisions.

Source: adapted from COWI et al., 2021 (Annex I)

5.1.3. Supply chain financing or value chain financing

Opportunities to apply this type of financing arise when a commercial organisation, usually in the food processing or retailing sectors, wants to take measures to reduce the carbon footprint of its products. Some of the GHG emissions comprising that footprint will arise directly from the organisation's activities, but other emissions will arise indirectly from the actions of its suppliers (e.g. farmers). The latter are sometimes referred to as a company's "scope 3" emissions. Financing a carbon farming scheme for its suppliers is one way for the organisation to reduce its carbon footprint. An example researched is Arla Food's Climate Check sustainable dairy project (see Box 12). While this scheme is currently action-based, it may be adapted to be result-based in the future.

Box 12 Arla Food's Climate Check sustainable dairy project

The project is aimed at the 9,900 farmer owners behind this European dairy cooperative, who are spread across seven countries. It aims to reduce the emission intensity of their dairy production by 30% between 2015 and 2030. Each participating farmer is required to input information covering everything from herd size to housing, milk volumes, feed usage and feed production, energy and fuel usage and renewable energy production. The project uses a digital reporting tool, the details of which are publicly available, to collect this information. The tool then models the farm's GHG emissions. The data is verified by an external advisor who will then visit the farm to provide advice on action plans to reduce GHG emissions. The aim is for farmers to achieve a reduction of 3% of their GHG emissions per year. In return, farmers who sign up to the Climate Check project in 2020 will be paid a financial incentive of one euro cent per kilo of milk for 6 months (equivalent to a 4% increase in the standard milk payment). *Source: Arla Foods*[22]

[22] *https://www.arla.com/company/news-and-press/2019/pressrelease/climate-check/ (accessed 20/08/2020)*

Another example is the Coop support programme for agroforestry, which is summarised in Box 13 and discussed in more detail in the agroforestry case study (Annex II).

Box 13 Swiss Coop support programme for agroforestry

This scheme has been set up by the Swiss food retailer Coop to encourage agricultural businesses in its supply chain to plant and care for trees on their arable and pastureland. The focus is on timber and wild fruit trees (e.g. walnut, oak, wild pear and sweet chestnut) that can be planted in combination with standard fruit trees. Participating farmers receive free advice on the choice, location and regular care of the trees, and receive a payment of CHF 75 per tree (for a minimum of 20 trees per farm). Payments are additional to any other form of agricultural support.

The aim is to provide emission reductions of 4,500 t CO_2/yr over 50 years, which are accounted exclusively to the Coop climate protection project. It uses the independent myclimate foundation to validate commitments made and provide oversight.

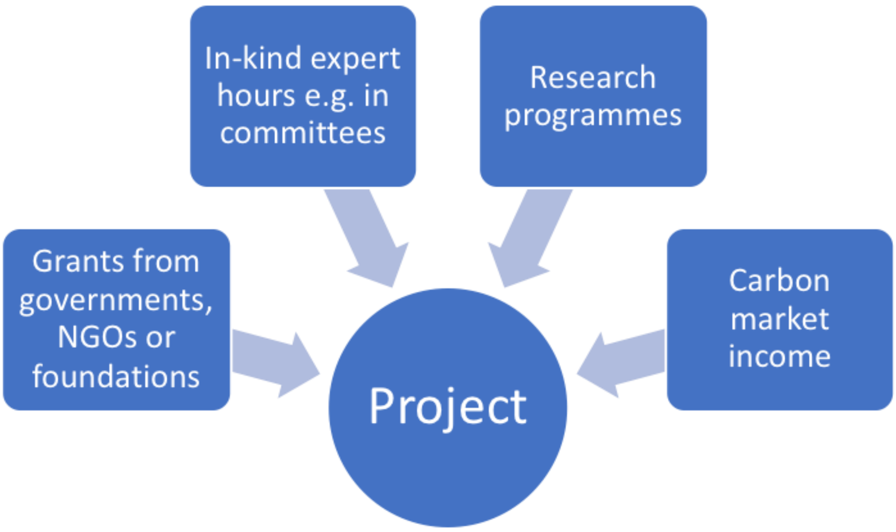
Sources: COWI et al., 2021 (Annex II) and myclimate foundation[23]

5.1.4. Combining different sources of financing

Even if the aim is to develop a scheme that, once set up, can be funded from the sale of carbon credits, it may be necessary to consider multiple sources of funding to cover all costs. In particular, covering upfront development costs may require additional sources of funding, as these can be significant.

The case study on peatland restoration and rewetting (Annex I) looked at how different aspects of scheme development and operation have been funded for peatlands. It found that for many peatland restoration projects the funding came from the four main sources described in Figure 6.

Figure 6 Principal sources of peatland restoration project funding



[23] *https://www.myclimate.org/information/climate-protection-projects/detail-climate-protection-projects/switzerland-land-use-and-forestry-7919-003 (accessed 20/08/2020*

For the projects examined for this case study, the in-kind support provided by experts, farmers and other stakeholders has proved very valuable throughout the development and operation of the schemes, especially in the early stages.

Many peatland projects were able to benefit from work already done on the development of MRV systems and on the measurement of emissions factors (EF) that was financed by research programmes not directly linked to the projects.

The case study on peatland restoration and rewetting (Annex I) also found an example, the MoorFutures scheme, where a principle has been established that up to 80% of the funding can come from federal and cantonal government sources, but at least 20% must come from carbon finance.

In other cases, funding has been sought specifically to help with methodology development. As already mentioned, the EU-funded LIFE programme has been one source of such funding. A good example is the LIFE Peat Restore project described in Box 14. It should be noted that LIFE projects always require co-funding from other sources, though at least some of this co-funding can be in kind, e.g. through people's time.

Box 14 LIFE Peat Restore project

This project, partly funded by the EU LIFE+ programme, aims to help mitigate climate change by rewetting peatlands. It is co-funded by nine partner organisations from Poland, Germany and the Baltic States, which include a range of public bodies and NGOs. It was set up in 2016 and will run until 2021. The project aims to develop and test rewetting techniques and develop ways of measuring their climate mitigation impacts.

Based on this work, management plans and restoration concepts for each of the peatland sites covered by the project are being developed to ensure their successful long-term management. The project also aims to share the knowledge gained more widely. The project's experience, as well as some best practice scenarios for reducing greenhouse gases, will be summarised in a guide to rewetting peatlands, which can be used by different stakeholders.

In addition, the project is organising national events, information materials, a photo exhibition and a documentary film in order to raise public awareness on the benefits of peatland restoration.

Source: LIFE Peat Restore website: https://life-peat-restore.eu/en/ accessed 21/08/2020

In all cases where different sources of finance are being used it is important to avoid double funding and to be clear about what each source of funding is being used for. There is a particular risk of double funding when a result-based carbon farming scheme is operating in parallel with another environmental land management scheme, whether result or action-based, since an individual management action may have multiple benefits and so might be rewarded through more than one scheme. The risk is especially high when the carbon farming scheme is also intended to produce co-benefits and when it is operating in parallel with another scheme with different or overlapping objectives. There are strict requirements for cross checks to avoid double funding on any schemes run using CAP funding. As well as increasing costs, double funding calls into question the additionality of reductions, reducing the environmental integrity of a scheme.

5.2. Objective setting and eligibility

By this stage in the process, considerable thought will have already been given to what objective(s) are feasible and/or desirable for the scheme. However, before going further it is important to formally set and clearly define the objective(s) of the scheme and the criteria for defining which farmers will be eligible to participate in it.

5.2.1. Defining clear objectives

Defining clear objectives for result-based carbon farming schemes is more complex than it might appear at first sight and this subsection introduces the factors that need to be taken into consideration. Some of these are specific to particular types of schemes, and reference is made to the case studies for further reading on these. There are a number of general principles, and these are the main focus of this section.

a. Primary objectives

The basic choice facing the designers of result-based carbon farming schemes is whether to make emission reduction, carbon storage or a combination of both the primary objective of the scheme. For some types of schemes the choice has been clear. For example, when aiming at maintaining and enhancing SOC in mineral soils the objective should be to increase the levels of SOC during the project period while also ensuring that the total GHG impact associated is positive (see Annex III for more details). When it comes to livestock farm carbon audits, the objective should be to efficiently reduce greenhouse gas emissions from livestock farms (see Annex IV). In other cases, the choice is more complex. Emission reductions produce faster results and have the additional benefit that they have no risk of impermanence. By contrast, increasing the size of a carbon sink is likely to be a much slower process, and is also at risk of voluntary or involuntary reversal.

In some cases, other factors may also influence the choice of the primary objective. The case study on peatland restoration and rewetting (Annex I) found that some existing schemes were primarily aimed at peatland re-wetting and others at peatland ecosystem restoration. The choice seems to be based partly on the nature of the peatlands and partly on the relative importance of climate mitigation and of environmental co-benefits.

The case study on livestock farm carbon audit (Annex IV) raised a more complex issue, that when setting objectives of a scheme it is important to avoid lock-in of climate inefficient farming, by considering the potential long-run and systemic impacts of the scheme. In the long-run, optimal land use is likely to be required to efficiently meet climate goals, whilst maintaining food security. That is, land use should consider the relative efficiency at which the land can produce human food (measured in kJ of energy or grams of protein) with low carbon emissions. This may mean that, at a system level, land that is highly suited to crop production (which has a high ratio of energy/protein per unit of GHG emissions) should not be used for dairy products, which on such land has a relatively low ratio of energy/protein per unit of GHG emissions (van Zanten et al., 2016)[24]. Accordingly, schemes should avoid lock-in of climate inefficient farming. There is a risk that schemes could improve profitability or incentivise long-run investments in farming systems or land use that are not aligned with long-term climate goals. In addition to incentivising inefficient land use, there is a

[24] Indeed, the authors conclude that no land that is suitable for food production should be used for growing feed.

risk that schemes could encourage climate actions that are inefficient at a system-wide level, for example, by incentivising increased use of feedstuffs that could be used more efficiently as food for humans (the so-called feed-food competition, see Zumwald et al., 2019). Scheme designers should consider whether feed-food competition and optimal land-use can be taken into consideration, potentially through indicators in farm carbon audit tools, through eligibility restrictions (e.g. negative lists that exclude certain farm types), or potentially by using an emissions intensity approach.

Whatever primary objective is chosen, it is important that it is couched in terms that minimise the possibility of perverse effects. Two key considerations for a climate change mitigation objective are that it needs to be framed to ensure both **additionality** and (wherever possible) **permanence**.

Additionality is about ensuring that the scheme produces desirable results that would not otherwise have happened. The case studies explore a number of aspects of additionality including environmental, financial and regulatory permanence.

Environmental additionality requires that the scheme should produce real net reductions in GHG emissions that would not have otherwise occurred. It also needs to avoid what is known as 'carbon leakage'.

Avoiding carbon leakage is a necessity, as progress towards climate neutrality is only possible through global net reductions in emissions.

Carbon leakage can arise, for example, if activities restricted by the scheme are simply shifted to another location. There are several examples in the case studies. These include the possibility that the benefits of peatland re-wetting may be negated by farmers draining other peatlands not covered by the scheme in order to maintain levels of production. Another example is when the additional carbon sequestered as a result of better management of SOC in arable fields is outweighed by the carbon released when other fields are converted from grassland to arable land. Requiring a whole holding to be entered into a scheme may be a partial but not complete safeguard against some forms of carbon leakage. If schemes are designed to produce fungible carbon credits, it may be necessary to keep a proportion of the credits in reserve to allow for the carbon leakage that cannot be eliminated.

Additionality can encompass the retention of carbon stocks that would otherwise have been released.

Additionality can encompass the retention of carbon stocks that would otherwise have been released. For example, that schemes that prevent the conversion of permanent grasslands to arable cropping can be amongst the most effective in securing net reductions in emissions (see Annex V).

Financial additionality ensures that reductions are efficient, i.e. the farmer is only being paid for actions they would not have done anyway. The two key questions to ensure financial additionality are:

- Is this something that farmers would have done anyway, perhaps to achieve improved productivity?
- Is it something they are being paid to do from another source, such as an environmental land management scheme with different or overlapping objectives, and therefore at risk of double funding?

Regulatory additionality implies that the scheme should require farmers to undertake measures that go beyond those required under EU, national or local legislation. This is particularly important within the EU, as almost all farmers receive CAP payments, which are subject to cross compliance (conditionality) requirements, which include both a range of Statutory Management Requirements (SMR) and standards of Good Agricultural and Environmental Condition (GAEC). The latter may go beyond legal requirements and do vary between Member States. A list of GAEC standards proposed for the 2021-2027 CAP, with a qualitative assessment of whether they have mitigation potential, is shown in Table 6.

Regulatory additionality, along with financial additionality, helps to ensure that landowners do not receive a double payment for the same action. Double payments occur if, for example, landowners receive a payment for an action under the CAP (e.g. planting riparian boundaries) and then an additional payment for the results of this action (i.e. for the associated mitigation impacts under a result-based carbon farming scheme). This is inefficient, as the additional payment of the result-based scheme is not leading to new actions or additional climate impact. It is also unfair, as the landowner is being rewarded twice for a single action. Regulatory and financial additionality tests can require that landowners prove that their actions would not have occurred without the result-based payment and that their action goes beyond the existing regulatory requirements, i.e. that their results are additional.

Table 6 Mitigation potential of proposed CAP 2021-27 GAEC standards

Main issue	Proposed GAEC standards 2021-27		Mitigation potential
Climate change	GAEC 1	Maintenance of ratio of permanent grassland to agricultural area, as a general safeguard against conversion to other uses, to preserve carbon stock	✔
	GAEC 2	Appropriate protection of wetland and peatland carbon-rich soils	✔
	GAEC 3	Ban on burning arable stubble (to maintain soil organic matter) except for plant health reasons	✔
Water	GAEC 4	Establishment of buffer strips along water courses	✔
	GAEC 5	Use of Farm Sustainability Tool for Nutrients	✔
Soil	GAEC 6	Tillage management reducing the risk of soil degradation, including slope consideration (minimum land management reflecting site-specific conditions to limit erosion0	✔
	GAEC 7	No bare soil in most sensitive period(s) to protect soils during winter	✔
	GAEC 8	Crop rotation to preserve soil potential	✔
Biodiversity	GAEC 9	Maintenance of non-productive features and	✔

and Landscapes		areas (to improve on-farm biodiversity). This includes a minimum share of agricultural area devoted to non-productive features or areas, the retention of landscape features, a ban on cutting hedges and trees during the bird breeding and rearing season and optional standard for avoiding invasive plant species	
	GAEC 10	Ban on converting or ploughing permanent grassland in Natura 2000 sites (to protect habitats and species)	✔

Source: based on legislative proposals for the CAP 2021-27 (COM(2018) 392 final)

If additionality is to be achieved and demonstrated, then it will be important that the scheme allows for the measurement of the baseline at the start of the scheme's period of operation. How this is done will vary greatly depending on the nature of the scheme, and scheme-specific information is provided in several of the case studies, particularly those on SOC and livestock farming. A common feature is that at least some baseline measurements are likely to be needed at farm level before or when agreements start.

The need to demonstrate additionality is particularly acute for schemes that aim to sell carbon credits on the market. The particular requirements these markets have for schemes to demonstrate additionality will be covered in section 5.4. To ensure additionality, schemes can retain a proportion of the credits produced as a buffer, to cover additionality being less than 100%.

Throughout the history of environmental land management schemes, the scheme developers have had to accept that it is seldom possible to achieve 100% additionality and it is almost always necessary to accept some deadweight or free riding. However, schemes must be able to estimate and manage this.

Permanence of GHG reductions should also be considered a primary objective. A widely-used standard is that any reductions in GHG emissions should last for at least 100 years. This is a particular challenge for time-limited voluntary schemes that are dependent on continuing payments to farmers, where the measures taken to reduce GHG emissions are readily reversible, as is often the case. Emission-reducing management techniques may be discontinued, re-wetted peatland may be re-drained, and grasslands may be converted to arable cropping. Even trees in an agroforestry scheme may be grubbed up.

Some schemes have accepted that the gains may be temporary and have issued temporary credits, but COWI et al. (2020) found that these have not proved popular. A range of measures to try to ensure permanence can be taken within a scheme, including eligibility criteria, long term contractual obligations and the use of risk buffer accounts. These are covered in greater detail in section 5.6.

Another important consideration is the extent to which the primary objectives should include **co-benefits**. Most types of carbon farming are likely to produce at least some co-benefits. For example, Box 15 lists environmental, socio-economic and animal welfare co-benefits of agroforestry.

Box 15 Co-benefits of agroforestry

Farm level benefits:

- Reduced soil erosion and nutrient leaching
- Improved soil functionality and water infiltration
- Diversified income stream for the farm business
- Improved animal welfare (shade and shelter)
- Better pollination services

Wider benefits:

- Improved water quality
- Increased biodiversity
- Potentially improved flood risk management

Source: adapted from COWI et al., 2021 (Annex II)

Including co-benefits in the objectives of the scheme may broaden its appeal to farmers, to partner organisations and potential funding bodies, but there may be tensions between the climate mitigation objective and the co-benefit objective. For example, peatland re-wetting, where peatlands remain in productive use, has the potential to deliver considerable net reductions in GHG emissions over a wider area and in a shorter timescale than the full-scale restoration of peatland ecosystems, but it will produce fewer co-benefits. For this reason, if the primary focus is on climate mitigation, then peatland schemes should focus mainly on re-wetting (see Annex I for a detailed discussion on this point). Having said that, even if it is decided that the objective of the scheme should be narrowly focused on climate mitigation, it is important that it avoids perverse effects on other important priorities.

All result-based carbon farming schemes should form part of an integrated approach to tackling climate change adaptation and the biodiversity crisis. This means the primary climate objective of the scheme should be one for which:

- there is **positive evidence of environmental co-benefit**s (even if these are not quantified as part of the scheme, they can inform the design and targeting of the scheme);
- there is **no evidence of adverse effects on other environmental objectives or co-benefits** in the context in which the scheme will be used

b. Secondary operational objectives

Several of the case studies point out the need for secondary operational or administrative objectives to sit alongside the primary climate mitigation objective.

Setting secondary, operational objectives can be helpful and sometimes necessary, but care should be taken to ensure that they remain secondary. It is all too easy for objectives involving uptake, spend and overhead reduction, all of which are easily measured, to be pursued at the expense of primary environmental or climate objectives. This is especially true for publicly funded schemes.

c. Linkage to wider climate action programmes and targets

A concern for all result-based carbon farming schemes, especially those owned by public bodies, is likely to be whether or not the reductions in GHG emissions generated can help to meet national, EU, and international climate ambitions.

Schemes need to coordinate the land management they promote with other national policies. This can avoid the need for the scheme to set all the rules and requirements for itself. For example, the Woodland Carbon Code relies on the UK Forestry Standard to ensure sustainable forest management.

Schemes also need to coordinate with EU policy. It has already been mentioned that the legislative proposals for the 2021- 2027 CAP include making climate responses one of the overarching priorities of the CAP. It is therefore very important that any result-based carbon farming scheme coordinates with the CAP and can show additionality with respect to other CAP schemes and their regulatory baselines (e.g. conditionality).

For all result-based carbon farming schemes, especially those that are publicly funded, it may be important for the GHG savings generated by the schemes to count towards national inventories of GHG reductions. To ensure that national inventory integration issues are addressed, the national inventory authority should be involved in the scheme design. They could establish an offset registry, issue offsets to project owners, and keep track of where they are used. They would then have the knowledge to make the correct withdrawals in the national GHG accounts before closing accounts. Some schemes (e.g. Woodland Carbon Code) require that all buyers and sellers are based in the same country as the scheme, to simplify national inventory impacts. Table 7 lists some questions that scheme developers need to consider ensuring appropriate levels of linkage and integration.

Table 7 Some questions for scheme developers and those in regional and national governments to consider ensuring appropriate levels of linkage and integration

Question
Which Ministry or department should be responsible for these schemes? What kind of setup is required at national level to ensure coordination and integrity?
What should the role of the Commission be in relation to national and regional schemes?
With which other regional, national or EU policies does the scheme need to be coordinated to avoid policy conflict?
If the carbon farming scheme is linked to national inventories, how should coordination be governed?
How should climate action data be recorded to simplify integration into national GHG inventories?

Source: COWI et al. (2020)

The third point in Table 7 goes beyond the scope of climate policy, because it is also important to avoid conflict between different policy objectives. There is fortunately a broad overlap between the actions needed to ensure reduced GHG emissions, climate change adaptation and the safeguarding of biodiversity, though there are still some tensions. Other policy areas may raise more fundamental issues. The EU has, for example, long established policies on maintaining levels of food production, so objectives that seek reductions in GHG emission intensity may be easier to integrate than those seeking absolute reductions, which farmers may find easiest to achieve by reducing or ceasing food production.

5.2.2. Eligibility for participation

Some of the factors determining which farms are eligible to join a particular scheme will be obvious. The geographic or other coverage of the scheme owner is one, applicability of the particular scheme is another. To be eligible for a peatland re-wetting scheme a farm must have peat soils. To be eligible for a supply chain funded scheme, such as that run by the Swiss food retailer Coop, farmers must be supplying the funding organisation.

Eligibility criteria do however need careful consideration as they can be very important in determining the effectiveness of the scheme. Restricting coverage and eligibility can enable scheme designers to design more specific and simpler schemes targeting particular farm types. This can enable targeted schemes with lower uncertainty of scheme emission reductions and lower transaction costs for farmers. This can increase uptake, as well as supporting additionality and permanence.

The case studies offer specific examples of how eligibility criteria have been and might be applied to different types of result-based carbon farming scheme. For example, eligibility criteria that might be used for schemes aiming at maintaining and enhancing SOC in mineral soils are shown in Table 8 (see Annex III for a more detailed discussion on this topic).

Table 8 Eligibility criteria for schemes aiming at maintaining and enhancing SOC in mineral soils

Eligibility criterion	Rationale
Agricultural systems in mineral soils.	To avoid confusion with other schemes such as those for forests or inappropriate application of the scheme e.g. on peatlands.
Restrictions to certain farm types or geographic areas within the above.	May be appropriate where geographical or sectoral analysis indicates that some areas or sectors have greater potential than others.
Whole farm must be entered into the scheme and no land may be withdrawn or entered during an agreement.	Necessary to ensure the integrity of the emission reductions and reduce the possibility of carbon leakage through displacement.
No conversion from grassland to arable land in the five years prior to the start of the project.	Necessary to ensure that the emission reductions achieved are not negated by increases due to conversion of grassland and to avoid the scheme being 'gamed'.
Regulatory criteria set out in legislation and Good Agricultural and Environment Condition standards	Helps to ensure additionality and avoid policy conflict.

(GAEC) for the Member State or Region.	
Prohibition of particular management practices e.g. addition of biochar.	Adverse impacts of this practice (competition for land, displacement of food production).

Source: adapted from COWI et al., 2021 (Annex III)

Eligibility criteria might be used to address the issue of permanence, for example of a SOC scheme in grasslands, whose benefits are very easily reversible. In such schemes, it may be worth making a **willingness to commit to permanence** one of the eligibility criteria and writing this into the contracts with the participating farmers. In addition, schemes that reward farmers to maintain existing grasslands can require that the land included in the agreement must have been covered by grassland for at least ten years prior to the start of the contract, and must be suitable for conversion to cropland. These are obviously sensible criteria, but are unlikely to avoid the problem of farmers who had no intention of converting their grasslands seeking to participate in the scheme (see Annex V for a more detailed discussion on this issue).

Agroforestry is a system that can potentially be applied to a wide range of farm types and eligibility conditions need to take local or regional circumstances into account. If a traditional form of agroforestry is under threat, then retaining that system and its stored carbon may be the main priority. In other areas, it may be the introduction of new agroforestry systems that offers the greatest opportunity. For this reason, an on-site assessment of eligibility may be necessary for agroforestry schemes.

For livestock farm carbon audits, it could be worthwhile to restrict participation to participants that are likely to achieve significant emissions reductions (i.e. large farms). The definition of a large farm will depend on the scheme type but could be based on animal numbers or area, with the level set so that the expected emissions reductions on the farm multiplied by the expected reward price will significantly outweigh the transaction costs involved (e.g. baseline setting and MRV costs). In addition, eligibility criteria could **avoid negative externalities and achieve wider benefits**. For example, if the farm audit tool excludes carbon sequestration or storage, eligibility criteria should be used to limit the potential for negative externalities affecting GHG emissions through loss or removal of carbon stores or sequestration potential. Given that peatlands or organic soils can release sequestered carbon under some forms of standard livestock management, farms with this land should be excluded from a livestock carbon farming scheme, and instead targeted with a scheme that accounts for soil carbon.

Setting appropriate eligibility criteria can help ensure the integrity and effectiveness of the scheme, avoid negative externalities, reduce scheme costs and increase the likelihood of permanence. The criteria will depend to a large extent on the nature of the scheme, but the case studies provide useful worked examples.

As another example, a crucial part of the design of a carbon farming scheme for peatland rewetting or restoration, is the definition of eligible condition categories and condition change scenarios. A condition change scenario is to be understood as an allowed change from one drainage and management state to another, e.g. between intensive arable production on a deeply drained peat soil to paludiculture. The condition categories defined for one existing scheme (the Peatland Code) are a combination of vegetation, landscape features and hydrologic regime. Land that cannot qualify for these condition categories cannot enter the Code and is therefore not eligible. The definitions of applied condition categories are given in Table 9.

Table 9 Peatland Code criteria for condition categories, serving as eligibility criteria for land to enter one of these categories

Peatland Code Condition Category	Description
Pristine	• Dominated by peat forming species (in most instances *Sphagnum* moss) • Never been modified by landuse: drainage, grazing, burning, pollution
Near Natural	• *Sphagnum dominated* • No known fires • Grazing and trampling impacts scare or absent • Little or no bare peat • *Calluna vulgaris* absent or scarce
Modified	This category can be split into two further categories (which will help to inform management/restoration plan) although both will have the same *Modified* emissions factor. <u>Moderately degraded</u> • Infrequent fires • *Grazing and trampling impacts localised and infrequent* • *Sphagnum in parts* • Extent of bare peat limited to small patches • Scattered patches of Calluna vulgaris <u>Highly Degraded</u> • *Small discrete patches of bare peat frequent (micro-erosion)* • Frequent fires • Frequent and conspicuous impacts of grazing/trampling • *No/little Sphagnum* • Calluna vulgaris extensive
Drained	Within 30m of an artificial drain (grip)
Actively Eroding	• Actively eroding hagg/gully system (*most of their length having no vegetation in gully bottoms with steep bare peat "cliffs")* • Extensive *continuous* bare peat (eg. peat pan) • Extensive bare peat at former *peat cutting site*

Source: COWI et al., 2021 (Annex I)

It is important to note the effect that external factors can have on eligibility. For example, the criteria applied under the CAP to define land eligible for direct payments has greatly restricted the area that farmers are willing to enter into peatland re-wetting or restoration schemes. This is because many of the condition changes listed in Table 9 would make the peatland ineligible for direct payments, resulting in a very substantial financial loss that the scheme is unlikely to compensate for. For this reason, it is important to overcome this obstacle to peatland re-wetting schemes if they are ever to be widely used.

The eligibility requirements for CAP direct payments will need to be modified to include re-wetted peatlands if result-based carbon farming schemes targeted at peatlands are to be applied at scale within the European Union

5.3. Choosing result indicators

The factors to consider when deciding whether suitable indicators exist to allow the development of a result-based carbon farming scheme were described in earlier sections (3.3.3 and again in more detail in 4.1.1).

By the time developers reach this stage of choosing result indicators, they should be reasonably confident that suitable indicators are available. However, further thought, testing and development are likely to be needed and this section explores what might be required.

5.3.1. Climate mitigation indicators

The need to measure climate benefit in terms of mtCO_2eq has already been mentioned in section 4.1.1. This can be either in terms of net reductions in carbon emissions or a net increase in stored carbon in soil and biomass. The contribution from different greenhouse gases can be converted to CO_2eq using of the IPCC GWP values. These are set according to number of units of CO_2 that would have the same global warming impact over a 100-year period.

CO_2eq has the great advantage of being a 'common currency' that allows the climate benefit of different types of scheme to be compared and simplifies aggregation of climate impacts from lower scales up to national inventories.

As also already mentioned, the IPCC has published Good Practice Guidelines for calculating CO_2eq. These provide methodologies for estimating national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases (IPCC, 2006). The Guidelines advise on how to collect data on emissions per land use category (e.g. grasslands), subcategory (e.g. grassland remaining grassland), carbon pool/other gas (e.g. non-CO_2 from biomass burning or soil carbon). They also propose default parameters e.g. emissions factors, global warming potential of different gases, and how to calculate emissions.

To meet the Good Practice requirements for reporting and accounting, carbon farming schemes must calculate emissions in line with IPCC guidance. The basic guidance was published in 2006 (IPCC 2006), but has since been subject to various refinements, which are set out in supplementary guidance published in 2019 (IPCC 2019a). Scheme developers are likely to need to consult both documents. Scheme developers should respect the land categories, take note of country specific or modelled emission factors, and where possible, use the same activity data as national inventories.

Climate benefits can arise either from reductions in GHG emissions or from carbon sequestration. The agroforestry case study recommends as an indicator carbon sequestration in above ground woody vegetation (which it admits is likely to underestimate the amount of carbon removed). Indicators of changes in the amount of carbon stored in soil are less reliable, and the case study on peatland restoration and rewetting (Annex I) concluded that carbon removal was too difficult and too uncertain to calculate over the relatively short periods that schemes typically operate and chose indicators of reduced GHG emissions. The livestock farm carbon audit case study also concluded that it was more appropriate and practical to focus on emission reductions.

Another choice already covered under the guidance on developing objectives in section 5.2.1 is whether to use absolute reductions in GHG emissions, reductions in GHG emissions intensity, or a combination of both for result-based carbon farming schemes that aim to reduce emissions from productive farming systems. The basic indicators needed to estimate the GHG emissions may well be the same for both absolute and intensity measurements, but estimating emission intensity will also need an indicator of productivity in order to determine the level of GHG emissions per unit of production (e.g. emissions per unit of milk produced). Even if the indicator used in the MRV system is one of emission intensity, it is good practice to be able to measure the change in absolute levels. This is necessary for the purposes of evaluating the scheme, and because emission intensity reductions are unlikely to be sufficient to reduce emissions in line with the proposed EU Climate Law, and therefore all schemes should aim for absolute emissions reductions.

Table 10 Examples of proxy measurements of climate mitigation benefit used by different types of result-based carbon farming scheme

Type of scheme	**Proxy measures**
Grasslands	Registered farm activities for which the potential for increasing carbon storage is known – basing the estimated carbon storage of these activities
	Enhanced biodiversity
	Increased water holding capacity
	Permanent ground cover
	Non-disturbance of soil and ground cover
Peatlands	Water table height, e.g. centimetres below surface
	Vegetation, i.e. abundance and status of certain peatland specific species
	Land use, e.g. grazing, arable, fallow, paludiculture, forest
	Subsidence (mainly used in tropical settings)
Agroforestry	Above ground biomass of woody vegetation (which in turn has to be estimated from simpler measurements such as tree diameter at breast height)
Livestock farm carbon audit	Different carbon audit tools require different input data, which together are used to calculate the climate mitigation impact. These input data generally include the following: ▪ Number and type of animals ▪ Herd management practices ▪ Type and amount of feed ▪ Fuel and electricity inputs ▪ Manure management practices ▪ Crop management practices

Source: own compilation based on COWI et al. (2021)

Scheme developers will need to choose between direct and proxy measurements of the GHG reductions achieved. Direct measurements, such as directly measuring levels of soil carbon, are often too expensive and technically difficult to routinely use at farm level, so the vast majority of schemes reviewed for this Guidance Handbook use proxy measurements of one kind or another. It is however very important for scheme evaluation that the robustness of the connection between whatever proxy measurements have been used and the ultimate indicator can be assessed and tested. Some examples of proxy measurements used by different schemes are listed in Table 10.

As explained in section 0, the use of proxy measurements inevitably produces a level of uncertainty, and the level of uncertainty is likely to determine the range of funding sources open to the scheme developers.

The livestock farm carbon audit case study (Annex IV), which advocates the use of a farm carbon audit tool to convert a range of proxy measures into an estimate of the overall GHG emission reduction benefits, identified a number of ways in which the uncertainty level could be reduced, which can also be adapted for other carbon farming types:

- use a farm carbon audit tool that is parameterised to local conditions;
- only apply the tool within an area made up of similar farms on which the local conditions to which the model is parameterised apply;
- allow the use of only one tool, to ensure consistency across farms;
- choose a tool that is based on more certain science and/or larger sets of data.

The peatland restoration and rewetting case study (Annex I) identifies a number of proxies used to determine the reduction in GHG emissions. Table 11 provides an example of how one of these factors, the Emissions Factors for peat soils in the different condition categories listed in Table 9 can be parameterised to the conditions found in the area where the scheme is operating.

Table 11 Possible approaches to determining Emission Factor (EF) values for peatland condition categories used in result-based carbon farming schemes involving peatland re-wetting/restoration

Factor	Project EF	Local EF	Country specific EF	Default EF
Data from:	Reference measurement on site	Local or regional reference data from another project	Implied emission factor reported for all peatlands (or organic soils) in national GHGI.	Global aggregation and averaging of data for broad land and climate categories
Applicability and reliability	Best possible	Satisfactory	In some cases, but caution needed considering various peatland types	Some project owners state that default EFs are not satisfactory for carbon farming, as they will not be representative of the land they are applied on. If the factor is sufficiently conservative, there is however only an economic loss and no integrity issue.
Initiatives	MoorFutures	Peatland Code Green Deal scheme in The Netherlands	Danish Wetlands Restoration RDP measure.	*None*

Source: adapted from COWI et al., 2021 (Annex I)

It should be noted that in the case of peatland there is a quite widespread view that the default EF values provided by the IPCC should not be relied on or, if they are used, they should be applied with a wide margin of safety to ensure that emission reductions are not over-estimated.

There is generally a trade-off between certainty of indicator measurement and cost, and most of uncertainty reduction measures are likely to increase costs. Direct measurement of peatland Emission Factors for example involves the measurement of GHG fluxes at site and over time (using chambers, eddy covariance or other available scientific methods). The peatland restoration and rewetting case study estimates that this can cost up to €10,000 per hectare per year and not surprisingly found no projects that had adopted this approach. Instead, some use measured reference data and others use rules of thumb. In central Europe a loss of

1cm depth of peat per year is often assumed from drained raised bogs, based on historic measurements.

The use of proxy indicators can reduce costs and may be inevitable if the scheme is to be cost-effective, but it always brings with it a level of uncertainty, and there is usually a trade-off between the cost and the level of uncertainty that has to be accepted.

One way of reducing the cost is to use as indicators measurements that are already being collected for another purpose. The livestock farm carbon audit case study reports that the CARBON AGRI scheme has found that data provided through the CAP direct payment applications are sufficient to cover 25% of audit tool CAP'2ER's needs. However, a lot of additional information is also required (e.g. about fodder, concentrate, fertiliser use, etc.). A 2013 study estimated that approximately 60% of data necessary to run complex farm audit tools would be available from farm records, with farmers able to provide accurate estimates to bring this to 90%.

Although the use of proxy indicators and existing measurements can reduce the cost and the time commitment of a result-based approach, it has to be accepted that all indicators are likely to require some additional farm-level measurements. Although these will be an extra burden on farmers, they can have the advantage of involving them directly in measuring the results of their management, increasing knowledge and awareness.

It is important that any indicators to be used by a result-based carbon farming scheme should be tested in the field before use. Testing should begin as early as possible and should involve a range of stakeholders, especially farmers. As well as ensuring that the indicators used are scientifically sound, involving stakeholders in the process of infield testing and piloting is also important in building confidence in the scheme among farmers and the end users of credits.

Testing should ideally involve work to validate any proxy indicators by comparing them with direct measurements. For example, the Portuguese Carbon Fund measured the level of carbon sequestration resulting from different grassland management practices on a sample of pilot farms, and used these levels to develop values that could be used to convert measurements of the extent of these practices into levels of carbon sequestration for the main project (more information on this project can be found in Annex V). Testing is also important to make sure that an indicator can produce consistent results over time, and the extent to which it is influenced by factors outside the farmer's control.

Before any indicators are used in a result-based carbon farming scheme, they should be tested in the field. Testing should begin as early as possible in the development process to allow indicators to be tested over time, involving farmers in the process. It is also worth considering a small-scale pilot of the proposed scheme, to allow the robustness and cost of indicators to be assessed under operational conditions.

5.3.2. Broader co-benefit indicators

If the objectives of the scheme include the delivery of co-benefits, then the scheme developers need to decide whether or not to extend the result-based payment to these co-benefits. There are potential advantages in doing this - carbon credits that can also demonstrate wider environmental or social benefits may be more attractive to some purchasers, but these advantages must be weighed against the extra cost and complexity of adding extra indicators, with their associated measurements.

Most agroforestry schemes aim to deliver carbon storage as part of a package of environmental benefits. An example of that is the Montado project in Spain, which is seeking to conserve biodiversity and contribute to climate mitigation by retaining and managing the long-established *montado* silvopastoral system in the Iberian Peninsula (see Box 16, and the case study on agroforestry in Annex II).

Box 16 An approach to developing sustainability indicators taken by the Montado project in the Iberian Peninsula

The *montado/dehesa* agroforestry systems represent approximately 4 million hectares of farmland in SW Europe, in the Iberian Peninsula. These characteristic cultural landscapes are important for biodiversity and although some areas are protected under Natura 2000 legislation many are in decline, resulting from inappropriate management and absence of management. The developers of this result-based scheme started by clearly setting out the results they want to achieve. These are:

- soil health and functionality of soil is preserved;
- the tree layer is able to regenerate;
- biodiversity of Mediterranean grassland is retained;
- biodiversity elements/features of the ecosystem are conserved.

The scheme development team have prepared a manual to use in-field for assessment and monitoring based on transects of features that reflect the different results they want to achieve. The monitoring approach focuses on the identification of features along the transect line. Indicators are based on visual images, hence the manual is often based on photographic guides to the different features and plants that can be used as proxies for the achievement of the goals. For example, different plant communities are linked to SOC, different habitat features, and evidence of tree regeneration.

The development team has however yet to convert this monitoring approach into a series of indicators suitable for use in a result-based approach. These remain under development. The team has found that, critically, result indicators have to be dependent on management (i.e. the farmer's actions), easy to measure, and understandable by the farmer, so that the farmer can interpret and adapt to make improvements. They intend to develop four different tiers for each indicator. This takes time and requires a clear scientific basis and supportive literature to transform this into usable on-site parameters.

The project team stress that indicators and evidence need to be tested systematically with farmers, researchers, and officials as part of the co-construction of the scheme. Their next step is likely to be a pilot project to fully test the approaches, including the result indicators and tools such as the infield handbook that is under development.

Source: COWI et al., 2021 (Annex II)

As previously mentioned, there are a number of existing result-based schemes operating in Europe aimed primarily at the conservation of biodiversity. Guidance exists on how to set these up (Keenleyside et al., 2014; Maher et al., 2018; Byrne et al., 2018; Chaplin et al., 2019).

If a farm carbon audit tool is being used, this may allow the result-based scheme to be extended to some co-benefits relatively simply. Farm carbon audit tools can calculate multiple sustainability indicators with the same input data (see the case study on livestock farm carbon audits in Annex IV). The CAP'2ER tool, for example, in addition to emissions reductions, reports energy consumption, ammonia emissions, nutrient runoff, carbon storage, biodiversity area, amount of people fed, and economic performance.

Developing satisfactory indicators for biodiversity is at least as complex as doing so for climate mitigation, if not more so, and the cumulative complexity of measuring the parameters for multiple objectives may make the MRV costs and burdens too great. Unless the co-benefits can be measured using very simple indicators, or the same ones used to measure climate mitigation benefits, it may be worth considering an action-based approach to the delivery of co-benefits, with scheme-level monitoring programmes in place to ensure the integrity of any co-benefits claimed by the scheme and to ensure that there are no significant negative externalities.

5.4. Monitoring, Reporting and Verification (MRV)

Monitoring, reporting, and verification (MRV) refers to how participants' climate actions and GHG emissions are reliably measured, how they are required to report these to authorities, and how authorities verify their accuracy. MRV is integral to result-based carbon farming schemes, as it is the step that quantifies the impact of climate actions, i.e. the result.

Monitoring refers to the quantification of GHG emissions or removals, and includes collection of data as well as calculation methods.

Reporting establishes how participants are required to record and communicate monitoring data to relevant authorities and/or government entities.

Verification refers to the process of establishing the truthfulness and accuracy of reporting.

MRV is at the core of ensuring that the scheme has environmental integrity, that is, that it incentives mitigation and removals that are real, additional, measurable, permanent, avoid carbon leakage, and avoid double-counting.

A key challenge in all result-based schemes is designing MRV systems that sufficiently accurately measure the impact of farmer climate actions at acceptable cost to the farmer and the administrator. There is a trade-off here: high stringency MRV can deliver accuracy but is associated with high costs (financial and time), which can reduce voluntary farmer uptake and the overall impact of the scheme.

5.4.1. Monitoring

Monitoring is concerned with quantifying carbon removals and GHG emissions. Monitoring carbon farming results is challenging for many reasons. Key sources of difficulty arise due to the diffuse nature of carbon farming emissions/sequestration (i.e. spread across wide areas, not a point source). In addition, there is wide variability across different geographies (due to the impact of local conditions such as weather, soils, etc.) and different species (i.e. different types of trees or animals will have different scales of impacts under the same climate actions). This means that small differences in otherwise similar farms need to be accounted for to ensure accurate monitoring. A final key challenge is the presence of interaction effects, including across multiple GHGs – e.g. peat rewetting increases carbon sequestration but also increases methane emissions.

This section explores different options for selecting monitoring approaches for different schemes, including measurement, modelling, and combined approaches. A key challenge is keeping costs low enough to encourage widespread uptake, whilst ensuring sufficient monitoring accuracy. We describe how this trade-off has been balanced in existing schemes, including the need to accept some unavoidable uncertainty when monitoring carbon farming schemes.

Technology and data availability promise to increase accuracy and decrease monitoring costs in the future. We highlight recent developments, especially those related to soil carbon and farm carbon audit tools, whilst pointing out current limitations of technologies and EU datasets. "Optimal" monitoring approaches will be different in every scheme, depending on the types of farm and climate actions that will be covered, as well as the number and size of participant farms and other local variables. To illustrate this, the section concludes with best practice monitoring approaches proposed in each of the case studies.

Box 17 IPCC Greenhouse Gas Methodology – Tiers 1 to 3

The IPCC develops guidance based on best available scientific knowledge to guide countries to calculate their GHG inventories under international climate agreements (i.e. UNFCCC and Kyoto) (IPCC, 2006). While their methodologies are designed for national reporting, many aspects are transferable and form the basis of carbon farming methodologies. Indeed, carbon farming methodologies should be aligned so that scheme results can be reflected in national GHG accounts.

IPCC guidance includes three different tiers of approaches, increasing in complexity, data, and accuracy:

- Tier 1: Uses IPCC-provided default emissions factors, simplifying assumptions, and simple methodology for calculating GHG fluxes.
- Tier 2: The same methodology is applied but instead of default emissions factors, countries have to use country-specific emissions factors (in some cases, regional-specific emissions factors and parameters), based on local monitoring data and research.
- Tier 3: Most complex methods that use models and high-resolution land-use and land-use change data.

Result-based carbon farming methodologies must align with at least Tier 2 methods, which can capture most sources of emissions and the impact of management actions on similar farms in a relatively accurate way. Tier 3 approaches are likely to be necessary to robustly model soil carbon, which requires higher resolution land-use data. Scheme designers must always consider the trade-off of higher costs and complexity associated with higher tier approaches, and weigh them up against the increased environmental certainty.

a. Monitoring approaches

GHG removals and emissions can be quantified through direct measurements or modelling, or through a combination of the two.

Direct measurement can be used to calculate changes in carbon stock (e.g. in soil or trees), which can then be translated into GHG removals or emissions. This involves site-visits and sampling or measuring to calculate changes in carbon. Some climate actions cannot be directly measured (for example, management change impacts on livestock emissions). However, direct measurement is a common approach for agro-forestry and soil carbon. Direct measurement is considered more accurate but can be expensive due to the need for site visits and sometimes laboratory tests.

Modelling involves estimating GHG emissions and carbon removals based on measurable proxies, using modelling relationships built on prior scientific knowledge. For example, farm carbon audit tools model greenhouse gas emissions and carbon removals based on proxies (such as livestock numbers and types, manure application method, feed, etc.), using emissions factors and integrative models (see Box 18). Farm carbon audit tools are examples of sophisticated modelling approaches, some of which draw on complex models and more than 150 different proxies as input data. Modelling can also be simpler, such as methods applied for agroforestry (see Box 19); these are associated with lower costs but higher uncertainty.

Combined measurement and modelling can enable model accuracy to be improved through ground-truthing, i.e. limited direct measurement is used to test and adjust modelling estimates. In reality, most direct measurement approaches require some degree of modelling to upscale measurement results (i.e. from specific field locations) to larger scales (e.g. whole farms). The New Zealand Emission Trading Scheme (ETS) methodology for forestry offers an example: participants with large forests use look-up tables, which estimate the amount of carbon sequestered in forests according to tree type and location, which is supplemented using direct measurement of tree thickness.

b. Selecting an appropriate monitoring approach

There is no one-size-fits-all monitoring approach that is optimal for all carbon farming schemes: even schemes which cover the same types of climate actions (e.g. hedgerows) will have different ideal monitoring approaches if applied in different places, depending on local context, scheme objectives, and other conditions. For example, a key determinant of the type of monitoring approach to apply is the intended use of carbon removals or avoided emissions that arise in the scheme: if the aim is to sell these as fungible offset credits, the level of monitoring certainty will have to be high to convince buyers that removals/avoided emissions are real and additional. If instead, the central aim of the scheme is to increase farmer knowledge and ability, the monitoring scheme could be less stringent. Local contextual elements, such as data availability, farm advisor and farmer capability, and existence of locally parameterised models will all shape the selection of the ideal monitoring approach.

For this reason, scheme designers will need to weigh up and select their own monitoring approach. Three criteria should be considered:

Criterion 1: Scientific robustness. Robustness refers to the ability of monitoring approach to quantify results (GHG emissions and other sustainability indicators) reliably (i.e. with low uncertainty). The monitoring methodology may only be robust under certain conditions (e.g. geography, farm type). This reliability will also be dependent on reliable data (i.e. the inputs upon which estimation are based – such as accurate animal numbers, soil type data, etc.). Scientific robustness refers to how accurately the monitoring approach can estimate results, that is, with what degree of uncertainty. This uncertainty cannot always be directly calculated. Indeed, no consistent method for measuring scientific robustness could be determined across all case studies. Alternative indicators of robustness include transparency, i.e. is the method clearly documented and publicly available? Another indicator is scientific process quality, i.e. has the methodology gone through scientific review, does it align with or apply best practice or standards e.g. are IPCC Tier 3 quantification methods used (see Box 17), and how trustworthy and unbiased are the involved scientists?

As an example of how existing schemes approach this issue, consider these two approaches identified in the livestock farm carbon audit case study (Annex IV):

- **Gold Standard**: The scientific robustness of new methodologies has to be approved by a scientific expert technical advisory committee, internal reviewers, and through a round of public consultation. Given that the uncertainty of results cannot be directly quantified, Gold Standard requires that inputs (emissions factors, data, and other inputs/coefficients) have an uncertainty level of less than 20% at the 90% confidence level, where uncertainty is known based on statistical sampling, published data, or other reliable assessment e.g. IPCC methods. If this uncertainty information cannot be calculated, this can be grounds for concluding that the methodology has not been proven to be sufficiently robust, as happened to a methodology under development related to Livestock Emissions using the Cool Farm tool (Gold Standard 2018).
- **Label bas Carbone** does not yet have a specific method for determining robustness/reliability, or calculating uncertainty. Instead, it relies on an ad-hoc scientific expert review and on having input into methodology design. For example, to approve the CARBON AGRI methodology as robust, it considered that the underlying monitoring tool (CAP'2ER) was based on the best scientific methods available (building on IPCC and FAO methods), largely parametrised to local conditions, and expert opinion.

When selecting a monitoring approach, the most important criteria is scientific robustness. This can be challenging to quantify but all methods should be based on the best available science, be transparent, and involve expert scientific review.

Criterion 2: Practicality. Monitoring approaches must also be relatively easy to implement, given local conditions. The simpler and quicker the monitoring approach, the lower the associated cost – for administrators and for farmers. The complexity, time and financial costs for farmers are a particular concern, as these act as barriers to their participation in voluntary schemes. Under this criterion it is important to consider whether the monitoring method is simple to explain and whether the actors responsible for implementing it will be able to implement it quickly. Another issue to consider is the availability of data: the more data that the person doing the monitoring has to collect, the more expensive and time-consuming it will be. Accordingly, monitoring approaches should take advantage of data already at hand (for example, already gathered by regional authorities, or related to CAP reporting, or collected by farmers as part of general farm management).

In practice, the type of monitoring that is practical to implement is highly dependent on the existing skills and knowledge of farmers, farm advisers, and administrators, and the state of scientific knowledge. Where those actors are already familiar with climate actions and the monitoring methods, and the science is more advanced, they will be able to bear more sophisticated monitoring requirements without bearing significant costs. These capabilities and scientific research level vary widely across Europe and across carbon farming sectors. This lack of capacity can act as a high barrier or bottleneck for effective monitoring, and can take a significant amount of time and effort to develop. The CARBON AGRI scheme identified that its ability to implement a sophisticated farm carbon audit tool monitoring approach depended on the 6-8 year development of the CAP'2ER tool (at a cost of €200-300,000), more than five years of related work, and long-standing relationships with farm advisers and farming stakeholders. As another example, to build the farmer capacity needed to measure baseline emissions across their dairy farms, Arla Foods offered incentives equivalent to boosting farmer payments by 4% for 6 months.

Criterion 3: Broader co-benefits and other objectives. Scheme designers must also consider if the monitoring approach will enable them to simultaneously monitor achievement of other policy goals. That is, can the monitoring approach help them to understand (and potentially incentivise) co-benefits such as improved farm economic returns, positive biodiversity impacts, reduced water usage, and animal welfare, as well as reduced negative externalities such as nutrient leaching.

Alongside scientific robustness, scheme designers must consider the practicality of monitoring approaches: they should be relatively easy to implement, as this will reduce transaction costs for farmers and administrators and increase uptake. Scheme designers should also keep in mind their broader objectives and select monitoring approaches that will support delivery of co-benefits (such as improved economic returns or biodiversity protection).

c. Trade-off between monitoring accuracy and cost

The quantification of GHG fluxes inherently involves some degree of uncertainty in the direct measurement or modelling of emissions. In direct measurement, uncertainty can arise in the upscaling of individual measurements to representative areas (e.g. due to assuming that soil carbon measurements in one corner of the field apply to the whole field). Uncertainty is even more pronounced in modelling approaches. This occurs as models are based on averages which will not be a perfect match for specific individual cases. For example, models use emissions factors, which are average relationships that relate proxies with GHG emissions or carbon removals, based on previous scientific research (e.g. emissions factors give an average number for how many tCO_2eq will be sequestered by a hectare of rewet peatlands). Uncertainties arise because this average emissions factor will not exactly capture the actual amount of GHG removed by a specific hectare of rewet peatland.

Up to a point, scheme designers can reduce uncertainty through more stringent monitoring requirements (e.g. extensive local parametrisation of models, requiring regular on-site visits for measurements, the use of conservative audit tool calculation assumptions, etc.). However, these more stringent monitoring approaches come with a trade-off: increased costs for participants and administrators. High cost monitoring approaches reduce the net benefit of carbon farming schemes overall, as they “eat up” the gains of reducing emissions, reducing the funds available for paying farmers. If farmers bear these monitoring costs as transaction costs (whether they are in the form of time, complexity, or financial costs), these reduce farmer uptake – and therefore the potential overall impact of the scheme. Accordingly, it is important to limit the costs of monitoring.

As MRV costs are correlated with the need for environmental certainty, a key solution to high monitoring costs is, if possible, to accept some degree of environmental uncertainty. As found in the case studies, different existing schemes balance the trade-off between MRV costs and environmental uncertainty differently. Some estimate expected change in emissions using observable proxies, while others require stringent on-site sampling – this trade-off must be balanced considering local objectives and context, including data availability and MRV options available. If the scheme aims to develop carbon credits or otherwise draw in external funding, the level of demonstrable environmental integrity must be high, potentially requiring stringent MRV and limiting this potential trade-off.

Monitoring carbon farming results will always involve some uncertainty. While this uncertainty can be reduced through stringent MRV, this can lead to high costs for farmers and administrators. To keep costs low, administrators can choose to accept higher levels of uncertainty.

In addition to accepting uncertainty, existing schemes offer examples of practical approaches to increase accuracy whilst managing costs for participants:

- **Administrator bears costs for farmers**: To ensure that farmers face low barriers to participate and maximise uptake, regulators can bear cost of monitoring for farmers, especially for initial baseline setting. For example, the CARBON AGRI scheme bears the costs of farm consultant support to gather and analyse initial data.
- **Differentiated monitoring requirements**: Monitoring requirements can be made stricter for large or riskier participants, and simpler (and cheaper) for smaller participants. For example, NZ ETS requires forests over 100 ha to have on-site measurements; smaller forests use default emissions factor tables. More detailed monitoring can also be offered as an added extra, where participants are incentivised to carry out more stringent monitoring by the promise of less conservative emissions factors (and therefore higher estimated removals/avoided emissions). For example, the MoorFutures peatland rewetting scheme offers a simple method based on observable proxies (e.g. water depth and land cover changes), as well as more complex modelling approaches.
- **Exclude some climate actions or participants:** Some climate actions or emissions/removal sources can be more expensive to monitor accurately than others. To keep costs low whilst maintaining accuracy, schemes can exclude more complex actions, such as soil carbon or below-ground biomass. Schemes can also allow only a narrow type of participants (e.g. only those from a small geographic region with similar farm management) and monitoring can then be tailored to this narrow range, decreasing the expected gap between average-based models and the individual participants.
- **Draw on existing science and data**: Developing new methodologies and gathering new data is costly. To keep costs low, schemes should, wherever possible, build on existing data availability and scientific research.

Box 18 Farm carbon audit tools

Farm carbon audit tools are computer or mobile applications that calculate a farm's GHG emissions/carbon sequestration based on input data that summarise the farm's management (e.g. livestock type and number, land use, soil type, cropping system, fertiliser application, etc.). Tools have been designed for livestock farms, cropping systems, and some also cover above and below ground carbon sequestration, although at differing degrees of scientific accuracy. As well as calculating GHG emissions (baseline and changes in fluxes), they can also calculate other sustainability indicators with the same input data, such as water quality or biodiversity impacts, and farm economic measures such as carbon efficiency of output. Examples of existing tools include CAP2'ER (used in the CARBON AGRI scheme) and Cool Farm Tool, among many others. The EU's under-development Farm Sustainability Tool could potentially be adapted for similar use or could support existing tools. New schemes can adapt existing, similarly reliable farm carbon audit tools, some of which can be re-parameterised to different local contexts or different types of farms.

The livestock farm carbon audit case study (Annex IV) concluded that farm carbon audit tools estimate GHG emissions (i.e. baseline) and emission reductions (i.e. results) with moderate levels of robustness for many EU livestock farm types and on-farm climate mitigation actions. Although 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.

Source: COWI et al., 2021 (Annex IV)

d. Technologies and data for MRV

GHG measurement in carbon farming is determined in part by technological progress. Technology is constantly developing, as shown by progress with GIS and satellite data over the last ten years. Scientific developments and increased data collection should increase MRV accuracy and reduce MRV costs over time.

The last decade has seen considerable progress in the development of new more accurate and affordable ways of monitoring emissions and removals for carbon farming. For example, farm carbon audit tools have become increasingly widely implemented and, thanks to ongoing scientific research, there is a growing body of evidence upon which to assess their applicability for EU farms. However, these audit tools still encounter challenges, as the locally specific emission factors that they require are not yet available at fine scales for many locations in Europe.

e. Data for monitoring

In addition to technological developments, increased data availability to support modelling of locally specific factors will support carbon farming uptake by reducing costs for farmers and administrators, as well as reducing costs. New EU data sets have become available or are being developed based on Copernicus-Sentinel satellite data. This offers some promise to reduce monitoring costs (as well as reporting and verification). However, the relatively coarse resolution of some of these datasets (for example, the 10m scale of Copernicus Sentinel data or the 2 x 2km raster of LUCAS land data) means only some climate actions will be monitorable. Box 19 summarises examples from the case studies.

Box 19 Existing and proposed approaches to monitoring

The five case studies describe a range of different models In the EU, not all of which are yet fully developed. The findings of the case studies are summarised as follows.

Peatland Restoration and Rewetting This case study identified a number of carbon-based farming schemes operating in Europe, including MoorFutures in Germany, the Peatland Code in the United Kingdom, max.moor in Switzerland; and the Green Deal scheme in the Netherlands. The most well established is the German MoorFutures project, which has been selling voluntary carbon credits since 2010, based on the emissions avoided by peatland re-wetting. These are measured using proxy measures, which are fed into a model to estimate the GHG emission savings, rather than by direct measurement. The quality of the data used in the model is critical and must be appropriate to the area and the peatland type.

The project has recently adopted an updated methodology that 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.

Agroforestry This case study has concluded that it should be possible to develop a monitoring system based on the UK Woodland Carbon Code, which is used by existing result-based afforestation schemes. It is sufficiently robust to allow participating landowners to earn credits that they can sell as voluntary offsets.

A problem with adapting this system to agroforestry is that the protocols for calculating the effects on SOC of either retaining or introducing agroforestry systems are not yet sufficiently robust to allow them to be used for a result-based carbon farming scheme, so any such system has to rely on calculations based on the biomass of the woody vegetation, which is likely to considerably underestimate the true climate mitigation benefits.

Despite this limitation, the case study found one operational monitoring system being used by the Swiss food retailer Coop to support businesses in its supply chain in the planting and caring for trees on areas in agricultural use. Although the carbon credits are not traded, the methodology is independently verified.

Maintaining and Enhancing Soil Organic Carbon on Mineral Soils. Despite the complexity of either measuring or modelling stocks of SOC, this case study identified some projects operating or being set up within the EU that have used or are developing tools for calculating changes in levels of soil carbon to develop monitoring protocols. There is little information on the levels of uncertainty with which these changes are measured. So far none of these schemes monitor all GHG changes associated with soil management.

Livestock Farm Carbon Audit. This case study found that there are existing whole farm carbon audit tools that are applicable to livestock farms. One, the CAP2'ER farm carbon audit tool, is used within the French CARBON AGRI methodology, which has been approved for use within the EU. It should however be pointed out that such audit tools inevitably require the use of many assumptions to bridge the gap between what can be measured and the actual GHG emission reductions/carbon removals. This means that a considerable level of uncertainty about the climate mitigation benefits is currently inevitable, though this might be expected to decline in future as the knowledge base and the quality and granularity of the data used to inform the various assumptions within the carbon audit improves.

Managing Soil Organic Carbon on Grasslands. Monitoring systems for result-based carbon farming need to monitor changes in SOC since this is a bigger and less volatile reservoir of carbon than that in the living vegetation. As already mentioned, monitoring SOC brings with it a degree of complexity and uncertainty. There are a number of projects in Europe that are developing climate mitigation monitoring systems for grassland, but the current limitations of the monitoring system have led the authors of the case study to recommend the use of a hybrid scheme, with farmers rewarded for actions for which there is evidence they will lead to GHG reductions/carbon removals, with an additional reward based on the estimates of the actual reductions/carbon removals achieved.

Source: COWI et al. (2021)

5.4.2. National carbon inventories and carbon credits

Under the UN Climate Convention, Annex 1 parties (including the EU and its Member States) are required to report their greenhouse gas emissions and removals every year in GHG inventories set up and reviewed in accordance with the IPCC Good Practice Guidance.

Inventory submissions have two elements: The Common Reporting Format (CRF) tables as well as a National Inventory Report (NIR). CRF tables report the quantitative information and the NIR must have a detailed methodology description as well as a thorough explanation of the estimations (e.g. data source and calculation methods). Annex I Parties that are Parties to the KP are also required to include additional GHG accounting information as outlined in Article 7. The official guidance document for GHG is the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, with a more recent IPCC report published in 2019 with updates on land use, among others[25]. The guidelines for reporting of carbon removals and emissions from land-use have evolved since the initial IPCC Guidelines were published in 1996.

The GHG inventories (GHGI) require reporting of grassland and cropland within the LULUCF sector, but reporting for grasslands is typically centred around changes in biomass due to land conversion. For peatlands, reporting is outlined within the guidelines for 'organic soils' or 'wetlands' and if the peatland is drained and used it can be classified under the agriculture category. Reporting of wetland drainage or rewetting remains optional, although the EU is designing an update the accounting rules[26]. Soil carbon has also been given more attention in the last set of LULUCF accounting rules that entered into force in 2013 and has been made more prominent in recent inventories. In addition, emission factors and activity data are used to estimate the total emissions and removals for the various land categories. They are reported in CO_2eq.

At a scheme/project level, reporting of emission reductions must still align with GHGI principles and requirements to ensure transparency and prevent double-counting. The IPCC guidelines are produced for inventory compilers and the researchers producing or suppling data and modelling support. They cannot be applied at project level directly. For each land category, national decisions, traditions, data restrictions and models apply, which are often national interpretations of IPCC requirements that have been adapted and refined following multiple reviews over the past 20-30 years.

This experience, data overview and methodological choices by the inventory team will be valuable support and steer for any sub-national or local, land or farm type specific scheme. National data, methodologies models or emission factors, can serve as a starting point or benchmark for scheme-level equivalents. Smaller, regional schemes like those presented in the case studies may not have the resources to develop specific methodologies, data or modelling tools that are precise enough to qualify for the national inventories. Aligning methodologies with inventory requirements can account for this. Scheme designers should make sure to follow national inventories, particularly with regard to applying the same and consistent default factors for emissions or removals, the same or higher resolution data, respect land use and spatial data categories, and similar assumptions/projections for baselines and reference levels.

In the case where the registration or reporting is not stringent, or where schemes have no established connection to national inventory compilers, the same mitigation

[25] IPCC (2019): 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

[26] https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2019-11-28_cc-42-2019_sca_peatland_standards_0.pdf

outcome can be claimed and accounted as an emission reduction at the national level as well as at the scheme level. Currently, most carbon farming schemes do not correspond with or share data with GHGI teams, creating the risk that activities within grasslands or peatlands are not accounted for in the inventories[27]. In putting together a carbon farming scheme, the link between national GHGIs and LULUCF accounts should be carefully considered. The CARBON AGRI methodology under Label Bas Carbone has been developed in close cooperation with the French GHGI to ensure alignment. In the case of the Danish Wetlands Restoration Rural Development Programme (RDP) measure, there is a simple Excel reporting tool developed by the GHGI team for project managers to fill out. This creates a small yet impactful link between the two groups.

5.5. Establishing the payment

This section explores how payments can be determined and looks especially at the extent to which payments may be influenced by the co-benefits that a carbon farming scheme produces.

5.5.1. Determining levels of reward

Most schemes analysed in this study generate income through selling the achieved emission reductions/removal enhancements (credits worth one metric tonne of carbon dioxide equivalent - $mtCO_2eq$). The prices obtained can be determined by markets, set through negotiation or fixed in advance.

a. Market-based reward determination

The price that project developers can attain varies greatly. As already mentioned, whether credits are sold in compliance or voluntary markets has a major impact on the prices. In addition, the expected rise in demand for carbon removals from international airlines after the recognition of REDD+[28] and similar approaches in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) will certainly have an impact on prices. In 2019, prices for Land Use and Forestry credits in the voluntary markets ranged from USD 0.5 to more than USD 50 per $mtCO_2eq$ with an average price of USD 4.3 per $mtCO_2eq$. In total, global issuance of credits in the Forest and Land Use segment amounted to 159 Million USD (Ecosystems Marketplace homepage, December 2020). The most relevant compliance markets for the schemes included in this study however achieved carbon prices between USD 6 and USD 13 per $mtCO_2eq$.

The prices obtained in the compliance market will depend to a large extent on the balance between supply and demand. National and regional governments and supra-national bodies such as the EU have a major role in determining this balance through the compliance requirements that they impose on organisations operating within their jurisdiction. Policy makers can either decide to impose stronger caps or change the percentage of allowance that can be offset. Market participants are typically only

[27] IPCC (2006): 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 4: Agriculture, Forestry and Other Land Use. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_06_Ch6_Grassland.pdf

[28] Reducing Emissions from Deforestation and Forest Degradation. Mechanism developed by Parties to the UNFCCC to reduce deforestation and forest degradation in developing countries.

allowed to offset a certain share of their allowance, as most policy makers would like to encourage them to reduce their own emissions, as well as buying offsets.

Imposing a stronger cap on emissions, but maintaining or increasing the percentage that can be offset, should have the effect of increasing the market price of carbon credits on the compliance market.

The prices obtained on voluntary markets have generally been much lower than on compliance markets, but there is more opportunity to boost both demand and prices by factoring in co-benefits. This is explored in greater detail in section 5.5.2.

The research done for this study suggests that for many types of result-based carbon farming schemes, markets alone are unlikely to generate sufficient returns to fully reward farmers and cover the cost of project development.

In most schemes that aim to sell carbon credits in the markets, the scheme shields individual farmers from at least some of the complexities of carbon credit trading. Box 20 summarises the three basic approaches used (see the case studies in Annexes I and III for more details). Table 12 compares some of the features of these three approaches, based on the experience of the European examples and global lessons learned and reported in COWI et al. (2020).

Box 20 Three approaches to shielding farmers from the complexities of carbon credit trading

Three approaches have been found in schemes focussing on peatland restoration and rewetting (see Annex I) and maintaining and enhancing SOC in mineral soils (see Annex III).

Scheme platform – The scheme operates an exclusive sale platform, selling the credits generated from different projects to different customers. This approach is used by Moor Futures, which assembles batches of credits from individual peatland restoration projects and offers them for sale at a price reflecting the cost of delivery for that project.

Intermediary driven – Individual project developers or credit off-takers help to develop the project and cover early phase costs, while securing the mandate and right to market and sell credits when these are issued. In this decentralised system, the scheme may operate a registry to help keep track of the credits, but the responsibility for ensuring their integrity is delegated. This approach has been used by the max.moor and Peatland Code schemes.

Exchange based – Under this approach, project developers from different schemes use a central registry and issuer to keep track of uniquely identified credits, which can be traded between buyers. This approach is applied by the Green Deal scheme in the Netherlands and allows for aggregation and selling of credits from many different sectors alongside peatland restoration.

Source: COWI et al., 2021 (Annexes I and III)

Table 12 Strengths and weaknesses of the three approaches

Model	Examples	Strengths	Weaknesses
Scheme platform	MoorFutures	If demand is strong, this allows for better price premium. Also, for farmers an all-serving scheme organisation eases administration and reduces transaction costs.	Only one marketing channel and weak pricing influence. Would not meet VCS, CDM, JI or EU-ETS standards for independency. Difficult to grow scheme as it is entirely dependent on willing and able experts.
Intermediary driven	Peatland Code and max.moor	Flexible setup, with reduced centralised costs of operating the scheme. Model creates opportunities for experts and businesses, thus it is easier to scale and grow.	Almost all landowners will have to contract advisers, developers and manage this work. More contracts and legal arrangements are necessary.
Exchange based	The Dutch Green Deal scheme	Transparent price setting and national level cost effectiveness. Performs better with increasing scale and allows for transparent price setting.	Limited or no opportunity to ensure price premium for co-benefits. Typical peatland credit development cost levels cannot compete with Energy Efficiency or other industrial credits. Depending on scheme and exchange rules, project aggregation may be difficult and create costly project preparation, including contracts and legal arrangements.

Source: COWI et al., 2021 (Annex I)

Schemes may also take steps to reduce the uncertainty level for farmers that is involved in relying directly on carbon credit markets. The case study on maintaining and enhancing SOC in mineral soils (Annex III) recommends paying farmers a set payment per tonne of carbon sequestered over the project period. It suggests that the scheme designer sets the price at a level that they can either cover from their own funds or that they expect they can recoup, for example by selling offset credits. The case study makes the point that this approach shifts price uncertainty away from farmers and places it on scheme administrators, who have greater knowledge and are more likely to hold relevant skills (i.e. related to credit markets, public financing, etc.) and can act to affect prices (i.e. through scheme design).

b. Non-market-based reward determination – reverse auctions

For result-based carbon farming, the distinction between market and non-market schemes is not entirely clear, as all such schemes involve a reward given in return for a defined product. However, in this context, it is taken to mean cases where governments or other public bodies are directly purchasing carbon credits (e.g. to meet national emission reduction targets).

One approach sometimes taken to determine the rewards payable to farmers is through reverse auctions[29], which allows governments or regulators to purchase GHG sequestration/reductions at the lowest price. COWI et al. (2020) found examples of this approach and recommends that only approved projects should be allowed to participate (i.e. projects that have already created and approved an ex-ante project plan). They would then offer "bids" to the regulator, which would detail how many GHG fluxes would be reduced (in tCO_2eq) and at what price. The regulator would then agree contracts with the lowest price offers up to a set budget or set amount of GHG flux reductions.

A problem found with this approach in other contexts is that encouraging competition on price alone can lead those bidding to take short cuts on quality, so it is important that bids are only accepted from projects that can demonstrate that their protocols meet the required standard to ensure the integrity of their credits and the absence of negative externalities.

c. Payments based on costs

An alternative approach is to determine the level of reward based on costs. The EU environmental land management payments made through the CAP have been set using the principle that payments to farmers should cover the costs they incur and any income they forgo (or their opportunity costs), and can include the farmer's transaction costs. This method of determining payments is accepted by the World Trade Organisation (WTO) as non-trade distorting and so qualifies the payments made as 'green box' under the state aid rules. Considerable flexibility is possible when determining payments using this method. In the case of CAP result-based payments, the level of reward can be based on assumed cost of achieving a specific level of result indicator, while considering MRV costs borne by the farmer as transaction costs.

COWI et al. (2020) points out that if governments consider their whole budget (or whole climate budget), then the benefit/cost ratio of paying for agricultural GHG reductions may be high, so there may well be a case for payments considerably higher than those available from the carbon offsets market. Care will however need to be taken to avoid breaching WTO rules on state aid.

The CAP is an obvious source of non-market funding for result-based (and action-based) carbon farming schemes. The seven year CAP funding cycle can be a problem for schemes where results take a long time to deliver, but it is possible to carry over some commitments from one funding cycle to the next.

COWI et al. (2020) also suggests that, where implementation costs will be offset within 7 years, annual payments could be made through CAP, calculated on the basis of the sequestration expected in that given year, based on assumptions in the initial

[29] A reverse auction is an auction where many sellers compete to offer a good/service to a buyer, as opposed to classical auctions, where many buyers compete for a good/service sold by one seller.

project plan. If the MRV system subsequently shows that sequestration is lower than expected in project plan, later CAP payments would be decreased until the overpayment is equalised (and vice versa if underpaid).

d. Reward timing

Timing can be a barrier. Result-based payments can be made ex-post, once the mitigation benefits have been achieved. However, ex-post payments lead to increased uncertainty for participants and can cause major cash flow issues, especially where, as is the case with peatland rewetting/restoration or agroforestry, substantial up-front investment is required. Both the uncertainty and the delay between expenditure and reward can be major barriers to uptake.

By contrast, ex-ante payments benefit participants and are likely to increase uptake, as upfront payments decrease payment uncertainty and circumvent the barrier posed by upfront costs. However, ex-ante payments are difficult to reconcile with the concept of result-based payment, as payments have to be made before the results are delivered. The schemes looked at for this study have found at least four different ways around this problem, all of which involve having an ex-ante as well as an ex-post element to the payments:

Make a separate (non-result-based) payment to cover up front costs. As already mentioned, almost all schemes rely on non-market funding and support for their establishment costs. Up-front payments could come from the same source. For schemes funded in whole or in part by the CAP, it may be possible to use Pillar 2 rural development measures for funding either productive or non-productive investments to help cover the cost of any capital works that are needed.

Fund ex-ante payments by selling ex-ante credits. Either the buyers of these credits or the scheme operators have to accept the risk of non-delivery of the promised climate mitigation benefits. In practice, this means selling the credits at a discount, which would reduce overall income. Examples of this approach are the Peatland Code and the Dutch Green Deal scheme (see Annex I on peatland restoration and rewetting). These applied discounts of 10% and 15% respectively. It is worth noting that ex-ante credits cannot be used in compliance markets, which generally give a better return.

Ask the buyers of credits to purchase them in two instalments. This approach, suggested in the case study Managing Soil Organic Carbon on Grasslands (Annex V), would involve purchasers paying a proportion of the price ex-ante, with the balance payable ex-post. The case study suggests that the ex-ante proportion should always be less than 50%.

Adopt a hybrid scheme approach. Farmers receive an annual action-based payment that covers a proportion of the cost of the changed or additional management and an additional ex-post result-based payment based on delivery of the GHG reductions. The majority of result-based schemes for the conservation of farmland biodiversity work on this basis, with the action-based element designed to deliver a basic level of management, and the result-based element linked to higher level biodiversity indicators that require more demanding management. This provides the ‘freedom to farm’ that is a major attraction of ‘pure’ result-based schemes. As an alternative structure for a hybrid scheme, the case study Maintaining and Enhancing Soil Organic Carbon on Mineral Soils (Annex III) found examples where farmers are paid up-front with a guaranteed payment (thus acting similarly to an action-based payment), the monitoring is done at regular intervals, and the farmers receive a top-up at the end of the commitment period which rewards the difference between the GHG reductions corresponding to the upfront payment and the total result.

Trying to fund ex-ante payments purely from carbon credit markets is likely to reduce what are already inadequate financial returns. In most circumstances, result-based carbon farming schemes without some form of ex-ante payments to farmers seem unlikely to attract sufficient uptake. It does therefore seem that most schemes will need to consider blending different sources of finance.

At the very least, the scheme may need to provide farmers with a financial bridge between the time when they have to spend money until the time when the credits are produced and verified. More likely, given the relatively poor returns from carbon markets at current carbon prices, most schemes will need to also have access to non-market sources of funding, such as the CAP.

5.5.2. Co-benefits and wider sustainability

A large number of the schemes reviewed for this project are intended to produce co-benefits alongside climate mitigation benefits, but very few have so far formally incorporated co-benefits and wider sustainability into their payment structures.

Co-benefits are very important for agroforestry schemes and the case study (Annex II) found that, although not all co-benefits are likely to be captured by the result indicators used, the fact that the scheme would deliver co-benefits contributes to generating interest from farmers (who are particularly interested in co-benefits such as improved soil condition and reduced soil erosion), and investors.

The agroforestry case study (Annex II) also found an example of a scheme under development that was planning to formally incorporate co-benefits in the payment structure. The Montado project is planning to stack different results and benefits to develop a weighted system of payment. The intention is that farmers would receive payments based on the number of result parameters they meet (above a baseline) and can progressively improve their performance, and as a consequence their payment.

The peatland case study (Annex I) did explore the concepts of bundling and layering as ways of presenting and monetising co-benefits when further developing carbon credits. This is explained more fully in Box 21, though it is not clear to what extent either of these approaches have been used in practice.

Box 21 Explanation of bundling and layering co-benefits

Two options exist to present and monetise co-benefits, including ecosystem services (ESS) for further development of carbon credits: bundling and layering.

Bundling is a grouping of multiple ESS in a package to be sold as a single credit. This option might be useful if only one ESS can be commodified. However, other ESS should be seen as additional, and allow for charging higher premium prices.

Layering refers to schemes where payments are made for several ESS, which are then sold separately. Layering is only possible where ESS can be commodified individually, and where a market demand exists. Layering should however be carefully quantified to avoid potential double-counting.

Source: COWI et al., 2021 (Annex III)

As noted in Box 18, farm carbon audit tools can use the same input data to calculate multiple sustainability indicators, and the case study found examples of schemes that hoped to use co-benefits to secure a premium price for their credits. Despite this, the case study concluded that result-based carbon farming schemes should only reward emission reductions, whilst recognising the importance of monitoring co-benefits and possible negative externalities. This is explained in more detail in Box 22.

Box 22 Recommendations on sustainability indicators from the livestock farm carbon audit case study

Given that the main aim for schemes based on carbon audits is to deliver emission reduction, the scheme should only reward them and not improvements in other sustainability indicators. This will allow to simplify the scheme, and keep uncertainty low.

However, broader sustainability impacts are important to farmers and to scheme designers (who are likely to have multiple goals), as well as to purchasers of offset credits/emission reduction credits.

Any co-benefit that can be monitored at low additional cost through the farm audit tool (or additional basic reporting e.g. employment numbers) should be monitored and reported. Scheme administrators should monitor changes in sustainability indicators to ensure that, if large negative externalities are occurring, the scheme can respond. In addition, to minimise the risk of significant negative externalities, where existing regulation does not already provide limits (e.g. through the Nitrates Directive), the scheme should set exclusion criteria that limit payments to participants who “do no harm” (with allowances for uncertainty).

Source: COWI et al., 2021 (Annex IV)

The case study on livestock farm carbon audits (Annex IV) did find examples where carbon farming schemes benefited farmers financially through lower input costs or improved productivity. It also suggested that farmers might be able to combine CAP payments for achieving biodiversity objectives (either result-based or action-based) with market payments for emission reductions, but care would need to be taken to avoid contravening rules on double funding.

A survey of result-based carbon farming schemes from across the world, in COWI et al. (2020), found that none of the schemes selling carbon credits on the compliance market took account of co-benefits. However, schemes operating in the voluntary market that operate through bilateral negotiations on prices between seller and buyer did sometimes use co-benefits to negotiate a price premium. These negotiations are not grounded on quantified effects, rather certain projects are naturally associated with co-benefits. For example, if a certain forest project area hosts an endangered species, this offers enough grounds for the seller to negotiate. The case study on peatlands (Annex I) found that voluntary buyers, as compared to companies that need to comply with an emission cap, are more likely to show broader interest in the socio-economic and environmental impact of a project and are thus willing to pay more.

COWI et al. (2020) includes details of three schemes operating in the EU that include some socio-economic and environmental sustainability indicators in their MRV practices, which form part of their reward criteria. These are listed in Table 13.

Table 13 Co-benefits included in the MRV for three European result-based carbon farming schemes

	Co-benefit/ ecosystem service	**Label Bas Carbone Forestry**	**Moor Futures**	**Ferme Laitière Bas Carbone CARBON AGRI**
Socio-economic	Creation of territorial economic added value	✔		
	Integration through employment	✔		
	Air filtration in urban areas	(✔)		
	Local valorisation of harvested wood	(✔)		
	Forest certification	✔		
	Consolidation of forest management	(✔)		
	Forestry insurance	(✔)		
	Nutritional Performance of animal product			✔
Biodiversity	Introduction of species	(✔)		
	Preservation of pre-existing biodiversity	✔		✔
Air	Air quality/ ammonia emissions			✔
Water	Consideration of aquatic environments or wetlands	(✔)		
	Improvement of water quality	(✔)	✔	✔
	Groundwater enrichment		✔	
	Flood prevention		✔	
	Improvement of biodiversity related to wetlands	(✔)	✔	
	Evaporative cooling		✔	
Energy	Energy consumption			✔
	Renewable energy produced			✔

Source: COWI et al. (2020)

COWI et al. (2020) reached a number of conclusions about the role of co-benefits in determining payments for result-based carbon farming schemes, listed in Box 23.

Box 23 Lessons learnt in relation to price premiums for non-carbon benefits

Quantifying broader socio-economic and environmental benefits can act as a safeguard and at the same time provide basis for a more elaborate reward scheme.

The quantification of socio-economic and environmental co-benefits to include price premiums in the reward scheme may not be desirable. In fact, the required MRV costs would drive the price up and evidence from certain domestic and international schemes has proved that there are buyers willing to purchase credits with non-verified co-benefits.

The efforts required to measure socio-economic and environmental indicators vary greatly across indicators. Scheme owners could take advantage of reporting requirements from other policies, e.g. the CAP.

Source: COWI et al. (2020)

The key points in relation to the role of co-benefits in determining payments for result-based carbon farming schemes are summarised below.

Where a scheme includes co-benefits amongst its objectives, it is important that consideration is given to how these are monitored. If it can be shown that there is good evidence that co-benefits are being delivered, that may make a result-based carbon farming scheme more attractive to farmers and potential investors. In the case of schemes selling carbon credits on the voluntary market, this can help secure premium prices. Co-benefits may also help attract funding from public bodies. There is little evidence that co-benefits secure price premiums in compliance markets.

Depending on the nature of the co-benefits, including their indicators in the MRV system used to determine payments can greatly add to complexity and costs. Most existing schemes do not include them for these reasons. If however co-benefits are to be used to help attract farmers or investors, it will be necessary to provide evidence that these co-benefits are being delivered. This can be done by qualitative assessment or by scheme-level monitoring.

In all cases it will be important to monitor any major negative externalities from result-based carbon farming schemes, and take corrective action if necessary.

5.6. Ensuring permanence

The need to try to ensure that the climate benefits of a result-based carbon farming scheme have a degree of permanence was mentioned in section 5.6 as part of the guidance on setting scheme objectives. It was recognised there that for schemes with a limited duration and relying on payments to farmers it is difficult to guarantee permanence solely through the internal design of the scheme. There are nevertheless a number of aspects of scheme design that can be helpful.

The risk of non-permanence can arise both from intentional and non-intentional reversal of the changes in management that have led to the climate mitigation benefits.

Non-intentional reversal is defined as that arising from causes outside the farmers' control. Examples include fire, drought or erosion. Intentional reversal is defined as that arising from participant negligence or intentional action i.e. reversals that are within the control of the participant to avoid.

Managing the risk of non-intentional reversal

The main measure used to cover the risk of unintentional reversal is the setting up of **risk buffer accounts**. Most of the schemes analysed by COWI et al. (2020) and a number of projects analysed for the case studies use these accounts for carbon sink projects. Only a certain share of the generated removals are sold as credits, whilst the remaining ones are held in a scheme-wide risk buffer account. In this case, project proponents bear the risks by foregone credits throughout the project duration. The proportion of credits set aside as a buffer varies greatly between schemes from as little as 5% to as much as 60%.

Managing the risk of intentional reversal

Risk buffer accounts can also be used to allow for intentional reversals, but most of the schemes looked at relied mainly on other measures. These include eligibility criteria, long term contracts, separate rewards for long-term retention, stakeholder buy-in, development of long-term markets, and transfer of land to non-commercial ownership.

Eligibility criteria may be used to select the farmers least likely or least able to reverse the changes. They can also be used to exclude those with only a short-term interest in the land, who may not be able to commit to long term management changes.

Long term contracts, sometimes known as conservation covenants, can be used to bind farmers to retain the reductions achieved during the scheme, but such contracts may reduce scheme uptake and are likely to become increasingly difficult to enforce as time passes.

Separate result-based rewards for long term retention are potentially useful, especially in the case of schemes aimed at promoting carbon storage. Securing funding so far in advance of payment is likely to be a challenge, but there is an example of a scheme operating in California that only paid for tree planting after the trees had been established for 25 years (COWI et al., 2020).

Stakeholder buy-in involves the use of advisory services and other measures to try to embed a commitment to GHG reducing or storage in farming culture. This is an area where the advice of social scientists can be particularly helpful.

Development of other long-term markets is not applicable in all cases but parallel measures, such as developing markets for the timber and fruit from the trees planted under an agroforestry carbon farming scheme can help ensure that the carbon stored is retained. Likewise, paludiculture can provide an economic use for re-wetted peatlands (see Box 24 for more information on paludiculture).

Transfer of land to non-commercial ownership. This will not always be possible or appropriate but may be in some cases, such as restored or rewetted peatlands. In these cases, project land might be purchased by a new owner without commercial ambitions, who is committed to the GHG (and ESS) protection goals, such as a public entity or NGO (COWI et al., 2020). The funds for the purchase could be raised through the expected GHG credits that the project will earn. In some cases, it may be possible for that body to re-sell the land subject to a suitable covenant to prevent reversal of the carbon saving measures whilst allowing some of the purchase money to be recycled.

Permanent restrictions on future land use. This approach is possible in some jurisdictions and is recommended by Moor Futures, which advocates using an entry in the Land Register that operates in Germany (Joosten et al., 2015).

Box 24 Definition and examples of paludiculture

Paludiculture (Latin '*palus*' = swamp) is the productive use of wet and re-wetted peatlands. It potentially allows for long-lasting, sustainable cultivation of peatlands. Paludiculture uses biomass from wet and rewetted peatlands under conditions that maintain the peat body, minimises GHG emissions and may enhance peatland-related ecosystem services and biodiversity.

It has been pioneered in Germany by the University of Greifswald, but there are also pilot-scale projects in the Netherlands and the UK.

Examples include:

- biomass harvest for direct combustion;
- low intensity grazing with water buffalo;
- common reed as an industrial raw material;
- cattail as fodder for dairy cows or as insulation material;
- sphagnum moss farming to produce a growing medium for the horticultural industry.

Source: Own compilation from Johnson et al. (2017)

Statutory or regulatory requirements additional to those set by individual result-based carbon farming schemes

Depending on the importance attached to permanence, policy makers at EU, national or regional level may wish to consider the possibility of complementing the measures taken within carbon-farming schemes to limit intentional reversal with stronger statutory requirements. One way would be encompassing the 'ratchet principle' that beneficial changes once made cannot be reversed. Any such requirements would also need to be very carefully thought through to avoid perverse effects, including baselining any requirements well before the implementation date to limit farmers taking pre-emptive action to avoid controls.

The proposed GAEC standards for the 2021-27 CAP[30] could be helpful, and the main objectives of the first three are all aimed at retaining SOC on farmed land, as follows:

- GAEC 1 Maintenance of permanent grassland as a general safeguard against conversion to other agricultural uses, to preserve carbon stock;
- GAEC 2 Protection of carbon-rich peatland and wetland soils;

[30] In proposed legislative text COM(2018) 392 final Annexes 1 to 12.

- GAEC 3 Ban on burning arable stubble (except for plant health reasons) to maintain soil organic matter

GAEC 9 is aimed at biodiversity but could be helpful in ensuring the retention of woody landscape features (see Table 6). Member States are required to define their GAEC minimum standards at national or regional level, and may prescribe additional standards in line with the main objectives defined in the proposed CAP Regulation.

5.7. Approaches to non-compliance and fraud

Fraud and non-compliance are risks with any schemes that offer a financial reward, especially schemes designed to produce outcomes such as reductions in GHG emissions that are inherently difficult to verify.

Risks of fraud and non-compliance can arise at a number of levels. Individual farmers may try to cheat the system, those charged with measuring or verifying the results may submit false data, scheme operators may try to inflate the benefits produced and in the case of schemes producing tradeable credits, these may be double counted.

It is important that those developing and approving new schemes are aware of all these possibilities and ensure that schemes have procedures in place to control the risks.

A number of ways of reducing the possibilities of fraud and non-compliance through the design of the result-based carbon farming scheme have already been covered elsewhere in this Handbook. Governance, covered in section 4.5, is very important for reducing the possibility of fraud by those operating the scheme. The MRV system (section 5.4) is central to avoiding fraud and non-compliance by farmers and registries are vital for avoiding double counting.

Governance

COWI et al. (2020) found that the governance systems of all the carbon farming schemes examined seem to rely on having procedures and entities to review and approve at three levels: methodologies, projects and verifiers.

The agroforestry case study (Annex II) stressed the importance of having an independent operator to validate the commitments arising from a scheme. The case study maintaining and enhancing SOC in mineral soils (Annex III) stressed the importance of **transparency**, and suggested publishing details of all the methodologies used by the scheme.

As already been noted, the bigger the scheme and the wider the geographical spread, the more formal the governance arrangements generally are. Smaller schemes with less formal governance mechanisms rely heavily on the integrity of the individuals involved, but including a range of stakeholders in the governance structure will provide additional safeguards.

MRV system

It is vital to maintain the integrity of the MRV system. The case study on maintaining and enhancing SOC in mineral soils (Annex III) recommends having a public registry recording all the farm level records in the MRV system except those that are commercially sensitive. COWI et al. (2020) suggest appointing independent auditors to control the risk of fraud in verification and accounting, though point out that this can be very expensive.

If farmers are required to self-monitor, which is a useful way of containing costs and building greater involvement, this brings with it an obvious risk of both fraud and intentional and unintentional non-compliance. Some level of independent compliance testing will be needed. This can be designed in cost-effective, smart ways, for example by randomised compliance testing of only a few participants (potentially hand in hand with higher fees for non-compliance to incentivise action) or by limiting tests to high-risk candidates (COWI et al., 2020).

Double counting

Double-counting involves the accidental or deliberate multiple use of the same unit of emission reduction or carbon sequestered, which can result from two situations.

First, where a private entity claims to have reduced emissions by using credits issued by another entity to offset own emissions, but where the actual emission reduction or carbon sequestration is also registered and accounted by the Member State in which the emission reduction or sequestration takes place.

Second, double-counting can take place where two private entities use the same credit. This situation can arise if there is no registry of credits and credits are on-sold/traded.

Key to preventing both types of double counting is the establishment of suitable, independent registries for projects and for tradeable carbon credits. Registries should have personal accounts and should have fraud prevention measures built in. Ideally, registries should be common to all schemes existing in a Member State and should ensure that, in reporting and accounting to the EU and UNFCCC, technical corrections in the accounts are made that reflect the exchange of credits between sectors (or Member States). To ensure this, the scheme owner aiming to set up a scheme should liaise with national inventory officials as part of the governance design process.

Controlling the risk of non-compliance with conditions intended to avoid negative environmental impacts

One of the issues with result-based schemes is that, unlike action-based schemes, they do not specify how land is to be managed to achieve the desired outcome. Because of this, some of the more established schemes have systems that monitor for negative social or environmental impacts. Table 13 lists the ways in which a selection of the schemes covered by COWI et al. (2020) address this issue. It can be seen that some involve use of the MRV system, whilst others operate at the project approval stage.

There is inevitably an element of judgement involved in deciding on whether the negative impacts are sufficiently serious to warrant the imposition of penalties. It may therefore be necessary to have an appeal process where judgements are disputed. It can be seen from Table 14 that a number of schemes have such processes.

Table 14 Social and environmental safeguards across schemes and details of appeals processes where they exist

Scheme	Social and environmental safeguards
Clean Development Mechanism (CDM)	▪ For sink projects: anticipated socio-economic and environmental impacts of the proposed A/R CDM project activity included in the Project Development Document (PDD). If the impacts are considered significant, an Environmental and Social Impact Assessment is required, alongside with monitoring and mitigation measures. ▪ Appeal process/grievance mechanism has been discussed but not agreed upon.
Joint Implementation (JI)	▪ No social safeguards beyond national legislation. ▪ Analysis of the environmental impacts of the LULUCF project in the PDD, including transboundary impacts. If such impacts are considered significant by the project participants or the host Party, an Environmental impact Assessment must be undertaken. ▪ Establishing an appeal process was part of the decision 6/CMP.8 for revisions of the JI Guidelines. No official process or revisions have been completed yet.
Verified Carbon Scheme (VCS)	▪ Project proponents need to identify potential negative environmental and socio-economic impacts and propose and implement mitigation measures. ▪ Additional standards such as the Climate, Community and Biodiversity Standards or Forest Stewardship Council certification may be applied to demonstrate social and environmental benefits beyond GHG emissions reductions. ▪ Appeal process: Two-step process, whereby complaints are processed by the VCS Association and overseen by the chief executive officer. If complainant is unsatisfied with the outcome, they may file an appeal (addressed and overseen by VCS Board).
Australian Emission Reduction Fund	▪ To prevent projects that might cause adverse outcomes for the environment or community, the scheme includes a negative list of activities not eligible under ERF, e.g. planting of weeds, establishment of vegetation on illegally or recently cleared land/drained wetlands. ▪ Appeal process: Project proponents can seek an internal review of certain statutory decisions before going to the Administrative Appeal Trial.
New Zealand Emission Trading Scheme (NZ ETS) and Permanent Forest Sink Initiative (PFSI)	▪ No social and environmental safeguards beyond national legislation.
California's Carbon Offset Program (CCOP)	▪ During adoption of the protocol, the California Air Resources Board conducts an analysis of whether there is any potential harm connected to potential projects; ▪ EIAs have to be performed if required by local, regional or national regulation; ▪ Appeal process: Disagreements among offset operators, verifiers and the Offset Project Registries may be appealed to CARB.
Ferme Laitière Bas	▪ Monitoring and verification: inclusion of socio-economic and environmental

Carbone (FLBC)	indicators in the farm audit/diagnostic.
MoorFutures	▪ No social and environmental safeguards beyond national legislation.
Healthy Soils for Healthy Food	▪ No social and environmental safeguards beyond national legislation.
Label Bas Carbone	▪ Monitoring and verification: Inclusion of socio-economic and environmental indicators in the methodology.
Carbon Action	▪ Not considered yet, the scheme is at a development stage.

Source: COWI et al. (2020)

As can be seen, a number of the schemes have no formal appeal process, and in other cases this was still under development when researched. However, some examples of established appeal processes were found. In CCOP, filing an appeal is typically done between the project developer and the verifier, with the possibility for a project registry, e.g. CAR, acting as a mediator or 'informational resource'. Under VCS, the procedure for settling disputes and entering an appeal process are contained within an entire section in the VCS guidelines. In the case where an external party is required for the process, the VCS Board will still make the final decision. In addition, the VCS has a scheme in place to file a complaint/appeal against the VCS procedures, rules, etc. In this way, VCS has multiple system checks against itself as well as against the other relevant parties (verifiers, registries, etc.) providing a safeguard against fraudulent behaviour.

5.8. Evaluation of result-based carbon farming schemes

Evaluation is a key part of the policy cycle and is essential for all environmental land management schemes. It is particularly important for a novel form of environmental land management like result-based carbon farming, if it is to be widely adopted as a core part of farming systems and land management policy. Lessons need to be learned from the different schemes that have been established and used to refine and improve those schemes. These lessons also need to be shared with others to advance the general level of knowledge about result-based carbon farming.

Evaluations are also important to maintain or bolster confidence in the scheme amongst farmers, policy makers and other stakeholders, and for that reason it is vital that the evaluation process is as transparent as possible. There is a good case for involving people or organisations that are independent of the operation or governance of the scheme.

Evaluations are also important as a way of picking up when things are going wrong, so that remedial action can be taken or, in the worst case, justify a decision to scale back or abandon a scheme.

Evaluations are likely to require the collection of more information than is needed for day-to-day operations and the need for this should be borne in mind when looking at baselining a new scheme.

Evaluation is an important part of the CAP policy cycle and Box 25 lists the purposes for which this is undertaken. These purposes of evaluation could equally be applied at the scale of evaluating a carbon farming scheme, whether or not it is publicly funded.

Box 25 Purposes of evaluation within the CAP policy cycle

- Timely and relevant advice to decision-making and providing input to political priority-setting.
- Organisational learning: the results of an evaluation can be used to improve the quality of an ongoing intervention and in the development, implementation and design of policies. Moreover, they can identify opportunities for simplification and reduction of regulatory burdens for future policies.
- Improving the legitimacy, transparency, accountability and demonstrating the added value of EU action.
- A more efficient allocation of resources between interventions, between the separate elements of a specific programme or activity, or between activities. Monitoring and evaluations results are key instruments to inform evidence-based decisions about effective spending on policy measures.

Source: European Commission (2017)

Formal evaluation of a result-based carbon farming scheme is important to demonstrate its achievements, build confidence in the scheme, identify any problems and find ways of improving it in future. The process of evaluation should be planned during scheme development, particularly so that the baseline data against which the performance of the scheme will be assessed can be collected at the start of, or prior to, the scheme's period of operation. Evaluation results should be transparent and shared widely to enable knowledge exchange and build trust.

5.8.1. Scope and timing of scheme evaluation

The case studies have all considered the evaluation process and recommend that evaluations should cover all aspects of a scheme's performance including:

- levels of uptake and farmer retention;
- impact on GHG emissions;
- environmental and social co-benefits;
- negative environmental and social externalities;
- economic impact;
- efficiency;
- equity.

The case study on peatland restoration and rewetting (Annex I) includes a diagram that summarises the recommended scope of an evaluation of a result-based peatland re-wetting scheme. This is equally applicable to all forms of result-based carbon farming and is reproduced as Figure 7.

Figure 7 Suggested scope of a result-based peatland rewetting/restoration scheme

Source: COWI et al., 2021 (Annex I)

Evaluations are likely to involve the collection of scientific and economic data, interviews with participating and non-participating farmers and consultations with stakeholders. The case studies suggest an annual cycle of review but the research into existing schemes across the world suggest that those that have a regular review cycle do it rather less frequently, typically every three years. For schemes funded through the CAP, the managing authorities are free to conduct internal evaluation reviews at any time.

There is a balance to be struck between the need to get timely feedback in order to fix problems and the time needed for the scheme to produce measurable change. The very considerable effort and cost involved in a full-scale evaluation also need to be taken into consideration. It is probably not realistic to have a formal evaluation at less than three yearly intervals.

This does mean that it is important to ensure that there are processes in place to provide scheme owners and those involved in governance with continuing access to information collected as part of the operation of the scheme. It is also important to encourage, or even require, regular feedback from those actually operating the scheme and from participating farmers.

Such ongoing feedback can be invaluable in spotting developing problems or opportunities for improvement or expansion, but it is not a substitute for formal evaluations, which provide the opportunity to look at a wider range of evidence in a more considered fashion.

Formal evaluations should be planned at appropriate intervals and should be complemented by continuing feedback on the operation of the scheme.

5.8.2. Data needs for scheme evaluation

Where direct measurements of climate mitigation or co-benefits are used in the MRV system, there may be an overlap with the result indicators. However, where proxy measurements are used it will be important to find more direct measures of the intended climate mitigation benefits and other co-benefits. This is necessary as one key purpose of scheme evaluation is to check the reliability of any proxy measures. Evaluations of result-based schemes for biodiversity have found instances where apparently sound proxy measurements of results have been found not to fully reflect actual results as measured using more direct techniques (see for example Chaplin et al., 2019).

It is also likely that a wider range of outcome indicators will be needed than is used in the MRV system in order to evaluate the wider sustainability impact of the scheme, since few if any schemes routinely measure all aspects of wider sustainability. It is likely that, for both climate mitigation and co-benefits, there will be a need to collect data for indicators that measure these outcomes as directly as possible.

This may include direct measurements of soil carbon, greenhouse gas fluxes from peat soils and from livestock, plant species composition of grasslands and others depending on the objectives of the scheme. Such measurements are usually expensive, time consuming and technically difficult, so some sort of sub-sampling will be needed to contain costs. Care must be taken to avoid conscious, unconscious or systematic bias when selecting the sample.

Baseline data is also very important for scheme evaluation, so it is worth commissioning data collection before the scheme starts operating and using data collection protocols that allow for comparable data to be collected in subsequent years. Where uptake patterns are not predictable it would probably be wise not to use protocols that rely on revisiting the same farms.

Careful thought needs to be given to the additional indicators needed to allow evaluation of the scheme's objectives, as well as its results. Additional outcome indicators are likely to be needed, and baseline data will need to be collected for them before the scheme starts operating.

5.8.3. Consultation

a. Farmers

As well as natural science, economic and operational data referred to above, it is also important to collect information on the experiences of farmers participating, or not participating, in the scheme. This should cover what they like about the scheme, what frustrates them, what would secure or prevent their future participation and how the scheme could be improved. One option is a questionnaire asking these and any other questions that may be appropriate. This has the advantage of being easy to distribute and easy to analyse, so a large number of farmers can be sampled.

The limitations are that a questionnaire may not draw out the full depth of what farmers think, or the reasons why. It may therefore be worth considering complementing a wider survey with a series of semi-structured interviews, allowing the interviewers to probe the reasons behind the answers given.

One obvious short cut might seem to be to consult farmers' organisations. This is worth doing as well, but should not be used as a substitute for direct consultation. These are usually membership organisations and may feel obliged to say things that they feel reflect, or will appeal to, the views of their wider membership, rather than the individuals with direct experience of the scheme.

b. Advisers, intermediaries and other scheme staff

All of these will have direct experience of the scheme in operation and should be given an opportunity to contribute to the review. Similar information gathering techniques to those suggested for farmers may be used. The views of advisers, who will have been visiting farms and talking directly to farmers are likely to be of particular interest. Different questions may be needed for different categories of people.

c. Stakeholders and the wider public

For those stakeholders with a major interest in the scheme it is worth spending some time exploring and discussing their views on the operation of the scheme, whether or not they are part of the scheme's governance structure. This should include stakeholders such as buyers of credits, if appropriate. This could be through the kind of semi-structured interview described above, but more interactive workshops may be appropriate in some cases.

Where it is felt necessary to involve those stakeholders with a more peripheral interest and the wider public, as it often is for publicly funded schemes, a more formal public consultation may be considered. This takes time. In some jurisdictions there are fixed minimum periods for such consultation exercises. Authorisation may be needed in advance and time will be needed to analyse what could be very large numbers of replies.

The design of the consultation document also needs to be carefully considered. Open questions may elicit more information, but it is much more difficult to analyse the responses to them that it is for closed questions. One way of at least partially overcoming the limitations of closed questions is to provide space for consultees to give the reasons for their answers, and to provide opportunities for consultees to make points not covered by the questions asked.

Consultation and discussion is just as important to an evaluation of a scheme as scientific and economic data. The methods used need to be carefully considered and tailored to those being consulted.

5.8.4. Analysis

The evaluation will require a lot of complex and disparate information to be processed, analysed and understood. Much of this will require specialist skills. It may therefore be worth commissioning separate reports on the different types of data and information. These might include analyses of:

- The operational data e.g. spend, numbers of participants, area under agreement, number of carbon credits issued etc.
- Data on the climate mitigation performance of the scheme;
- Data on environmental or economic co-benefits and any adverse externalities;

- Information on the views expressed during the various consultation exercises.

Some of these may be able to be done by the scheme operators, some may require external expertise. To ensure transparency, there is sometimes a need for the analyses to be seen to be independent, even where the operator would have been able to do the work.

A key task is then to put the results of these different analyses together, draw conclusions from them and make recommendations based on the conclusions. This task needs to involve people with a detailed knowledge of the scheme and independent people. The former will ensure that the recommendations are targeted and workable, while the former will challenge existing ways and mind-sets and will bring in their wider knowledge of current advances in areas relevant to the scheme.

5.8.5. Implementation of scheme evaluation findings and recommendations

Once the evaluation has been completed, it is vital that lessons are learnt and that recommendations are put into practice. It may be worth ensuring that key influencers and decision takers are aware of the evaluation, especially if the report is positive.

One problem with changing scheme rules and procedures is that it can be very disruptive for existing participants. To get round this, the case study on maintaining and enhancing SOC in mineral soils (Annex III) suggests 'versioning' the scheme so that the rules and procedures stay the same for existing participants, but those signing new agreements, or renewing existing ones, move to a new version that incorporates any changes recommended by the evaluation. This is a sensible approach, unless the analysis reveals serious flaws that cannot be allowed to continue any longer than necessary.

5.8.6. Examples of evaluations of result-based carbon farming schemes

The case studies found few examples of formal reviews from result-based carbon farming schemes operating in the EU, but the analysis by COWI et al. (2020) of EU and global experiences on carbon farming schemes and results-based payments linked to climate objectives found some examples, which are summarised briefly in Table 15.

Table 15 Examples of formal evaluations of result-based carbon farming schemes

Scheme	**Frequency/number of reviews**	**Description**
Australian Emissions Reduction Fund	Required every three years. Additional ad hoc reviews.	Review involved the public and the results are publicly accessible. Most recent (2017) looked at crediting and purchasing. Additional 2016 review looked at how the scheme was operating.
New Zealand Emissions Trading Scheme (NZ ETS)	Three reviews so far – 2008, 2011 and 2015.	Reviews of this scheme have resulted in changes and amendments incorporated into all three government agencies and their roles in the scheme. In the midst of these reviews, in 2011, the New Zealand government instated an independent panel to take over the review process.
Verified Carbon Scheme (VCS)	Frequent intervals	There are ongoing assessments of existing and proposed methodologies, programmes, project registration and verified carbon unit issuance. The VCS Association revises the projects annually and quarterly. A wider public consultation has also been held.
California's Carbon Offset Program (CCOP)	Driven by changes to legislation	Reviews of this programme have been driven by changes to the State legislation governing the cap and trade system under which it operates, rather than in response to internal evaluations. One such amendment required that regulated entities must source at least half of their offset obligations from projects that provide proven and direct environmental benefits.
Clean Development Mechanism (CDM)	Annually	The CDM produces annual reports to the Meeting of the Parties to the Kyoto Protocol (CMP) regarding the mechanism and also publishes regular reports to the CDM EB. The CMP publishes guidance to the CDM every year with the most recent decision found published in 2018 (Decision 4/CMP.14).
Joint implementation (JI)	Annually	This scheme also produces annual reports for the Meeting of the Parties to the Kyoto Protocol (CMP).

Source: based on COWI et al. (2020)

An important lesson from the experience with the reviews of the Joint Implementation scheme is that it is easy for reviews/ evaluations to become too complex and bureaucratic, and too detached from the operation of the scheme.

Evaluations of other environmental land management schemes

Useful lessons can also be learnt from other environmental land management schemes. One good recent examples are the final reports produced for the pilot result-based schemes in arable and upland grassland systems in England (Chaplin et al., 2019) and grasslands in Ireland and perennial crops in Spain (Maher et al., 2018). These pilots were designed around its eventual evaluation from the start. This involved the development and testing of result indicators, an assessment of the environmental performance of habitats under result-based contracts and a review of the accuracy of farmer self-assessment. They also tested the cost-effectiveness of the schemes and explored agreement holder and stakeholder attitudes to result-based payments. The evaluations were largely carried out by the teams responsible for designing and operating the pilots, and the England pilot was independently peer-reviewed by a series of people with relevant, specialist expertise. The summary findings of the evaluation of the England pilot contain findings relevant to all result-based environmental land management schemes and are listed in full in Box 26.

Box 26 Summary conclusions from an evaluation of pilot result-based approaches to the management of arable and upland grassland systems in England

- Proxy indicators need to be extensively tested in the field to identify any potential unforeseen/perverse outcomes.
- Result measures require ongoing validation, comparing result scores with traditional habitat condition assessment methodologies/other direct measures using longer time series, to confirm that simplified measures are good proxies for their objectives and that there is no divergence over time.
- To limit the use of result indicators reliant on more subjective assessments, such as percentage of cover, and to recognise the greater variability in scoring that may result if they are adopted (e.g. by using fewer payment tiers, accepting that this may reduce the incentive effect).
- Weather is a significant factor that affects both agricultural and environmental results. Successful delivery of many biodiversity outcomes is closely linked to characteristics, such as wetness, which are affected by the weather. Result indicators which are very sensitive to weather conditions should only be used where potential management interventions are available to directly influence these characteristics. Provided that this is the case it is not unreasonable to expect farmers to make more interventions in some years to deliver optimum results (or accept a lower level of results, which would be no different to agricultural production affected by weather).
- The need for clear safeguards to apply if truly ‘exceptional weather’ is experienced so that land managers are not unfairly exposed to risk beyond their control and are aware of this when they enter an agreement. The pilot has explored a number of potential options for this and different approaches may be more suitable for different outcomes.
- Defined assessment windows are important to ensure any independent verification takes place as close to the self-assessment survey date as possible.
- Developing single result measures for species with different habitat requirements is challenging. This has been highlighted in the development of the breeding wader measure where three of the target bird species have broadly similar habitat requirements but the fourth shares many requirements but also has some significant differences. This highlights the challenge of defining simple habitat condition objectives that can satisfy the requirements of multiple target species.

6. Stakeholder engagement, capacity building and transparency

All these topics were touched on in Chapter 3. This chapter provides more detailed guidance on the issues that need to be addressed to ensure the success of a result-based carbon farming scheme. Section 6.1 deals with how to secure the engagement of farmers and other stakeholders in scheme design and operation, and how to help ensure that farmers will participate in the scheme. Section 6.2 looks again at capacity building, focusing on advisory capacity to support farmers participating in the scheme, which is one of the biggest challenges that those wishing to develop large scale schemes are likely to face. Section 6.3 looks at ensuring transparency, which is vital for maintaining confidence in result-based carbon farming schemes.

6.1. Stakeholder engagement

This section provides guidance on the two distinct issues of securing the engagement of farmers and other stakeholders in scheme development and that of securing sufficient uptake of the scheme by farmers. The issue of securing engagement in scheme evaluation was dealt with in section 5.8.3.

6.1.1. Stakeholder engagement in scheme development

The importance of engaging a range of stakeholders in the scheme design process from an early stage, and continuing to involve them, was covered in the guidance on governance in section 4.8. All the case studies stressed the importance of this.

There is an obvious need to engage farmers and landowners. The farming community is likely to be at best sceptical when the idea of result-based carbon farming is first mentioned. COWI et al. (2020) found that when result-based carbon farming schemes were first proposed in Australia and New Zealand, two of the main concerns expressed by farmers and landowners were that the schemes would interfere with their 'freedom to farm' and that there would be a high degree of risk. Once farmers and landowners were convinced that the schemes were not unduly prescriptive, they were much more willing to engage. European farmers are likely to have similar initial concerns. Farmers are also likely to be concerned about increased complexity and transaction costs (for a discussion on this issue, see the case study on managing SOC on grasslands (Annex V).

Ultimately, farmers will need to be convinced that result-based carbon farming is likely to provide them with a return at least as good as their existing farming systems. Authorities at regional, national and EU-level all have a role in this through the way that they set the underlying policy framework within which result-based carbon farming schemes operate (see the case study on peatland restoration and rewetting in Annex I on this point).

In the case of peatland re-wetting or restoration schemes, convincing farmers to participate will mean creating a system where peatland rewetting could potentially be more profitable than having regular agricultural practices, as well as ensuring that all provisions that are supporting the degradation of peatlands are removed. In this respect, adjusting the rules on the eligibility of drained and undrained peatlands for CAP direct payments is very important.

All the case studies recommend actively engaging farmers in the scheme development process to increase buy-in and uptake. In order to do this, at least some farmers need to be sufficiently convinced of the potential of result-based carbon farming to be prepared to give their time to help with the scheme development process.

In the initial phases of the projects, awareness-raising and active recruitment of farmers' representatives can mobilise interest and acceptance of the project. Projects can organise information campaigns, drawing on known and accepted communication channels (farmers' newspapers and magazines, radio channels, online formats) and working closely with advisers who know individual farmers. Because recruitment of farmers is a time consuming process, projects should plan to invest several months and up to a year for sufficient interaction and on-boarding of farmers. It is important that realistic expectations are communicated, as well as any uncertainties that exist in monitoring and reaching the climate impacts and how the scheme would manage these uncertainties for farmers.

If the continuing engagement of farmers and landowners in the development of a scheme is to be secured, then they need to be treated as business partners and the views and the feedback they provide should be taken seriously.

In recruitment, it is worth using local advisers or others with a good knowledge of the farming community to identify individuals who are respected by their peers and have a track record of being interested in new ideas. Effort could then be put into convincing them of the potential merits of the proposed scheme. Arranging for them to talk to experts and local scheme owners may be helpful, but if these farmers could also be offered a visit to a scheme that is already working and given the opportunity to talk to participating farmers, that is likely to be more effective.

The schemes should also build in ongoing training and advisory opportunities that enable learning, including peer-to-peer exchanges. These can offer targeted problem-solving. Demonstration days and ongoing analysis of the impacts of different farming practices in terms of results measured can provide informational support for farmers.

Apart from farmers and landowners, other groups of stakeholders that are likely to have useful contributions to make to scheme development, or who need to be engaged to avoid them becoming hostile to the scheme, may include:

- representatives of relevant national or regional government bodies, especially of any that are regulators or potential funders;
- potential private sector funders, such as water companies or authorities, carbon trading organisations or food businesses seeking to influence emissions from their supply chain;
- scientists, agronomists or others with expert knowledge of the processes by which GHG emissions can be reduced or carbon stored and of the farming system that the scheme is hoping to influence;
- representatives of the local communities within which the scheme is intended to operate;
- representatives of relevant environmental and other NGOs with an interest in the scheme.

The case study on peatland restoration and rewetting (Annex I) found an example of a scheme, the Peatland Code, where the composition of the steering group was based on an initial stakeholder analysis and this may be good practice in many cases.

Engaging a range of other stakeholders in scheme development is useful in bringing in a wider range of knowledge and expertise. It may also be useful in countering any tendency for farmers' interests to take precedence over the effectiveness of the scheme in delivering climate mitigation and other environmental benefits. It does however mean that the governance structure may include people with contrasting views and potentially conflicting interests. They may even express themselves in ways that make mutual understanding difficult. Communications experts should be used to overcome barriers and facilitate discussion. Skilled facilitation is certainly likely to be needed if a sufficient consensus is to be built.

The question of when in the process to engage stakeholders was mentioned in section 4.5, which suggested that governance structures should be formalised after the scheme owners had conducted an initial feasibility study and confirmed that the proposed scheme was at least potentially viable, but before any major decisions had been taken. This does not of course preclude, and may require, earlier, less formal stakeholder engagement to test opinion or explore options.

This Handbook is applicable where the scheme owner is an outside body, a public authority, a private company, an environmental NGO or a group of researchers, but it is possible for schemes to develop from initial ideas put forward by local farmers or from local communities. This seems to have been at least partly the case with the development of the biodiversity focused, result-based Burren Programme in Ireland, researched for the case study on managing SOC on grasslands (Annex V). Although initiated as a result of a PhD student's study looking at the local farming and state of the environment, abandonment of farm areas, degradation of the environment, etc. this project took a farmer-centred approach from its inception. This initiative started by addressing farmers' apparent needs, like re-establishing stone fences around fields, and then step-by-step integrating biodiversity and sustainable farming practices. It developed along the way, designed around the farmers, with the needs and potentials identified by the farmers. Only later were the public authorities persuaded to engage with the scheme.

Looking forward, the EIP-Agri programme financed by the CAP cooperation measure, has the ability to fund such 'bottom up' initiatives using CAP Pillar 2 funding to support the formation and functioning of 'Operational Groups'. These groups can be formed to develop a whole range of pilot or innovative projects, which can include climate change adaptation and mitigation projects.

A short description of the purpose of operational groups and how they can be funded is provided in Box 27. They could be particularly useful for helping to develop and pilot some forms of result-based carbon farming that are less well developed, where further innovation is needed and where there is strong local interest. An example might be projects seeking to retain and adapt locally characteristic, traditional forms of agroforestry.

Box 27 The EIP-Agri programme and its relevance to the development of result-based payment schemes

The Agricultural European Innovation Partnership (EIP-Agri) has the objective of promoting agricultural innovation that is more resource efficient, productive, low emission, climate-friendly, and resilient and that operates in harmony with the essential natural resources on which farming depends.

This might range from projects that target the development of new products, practices, processes and technologies to testing and adapting of existing technologies and processes in novel geographical and environmental contexts.

Field trials, pilot projects, joint working processes, short supply chain activities, initiatives for climate change adaptation and mitigation, collective environmental projects, and many more activities might be involved.

EIP-AGRI aims to be a flexible and open system for the bottom-up creation of a multiplicity of Operational Groups, tackling the needs and opportunities of farming practice. It can either support a new project proposed by a new group, or a new project proposed by an established group.

Operational Groups are currently funded through CAP Rural Development Programmes. Although managing authorities do not set up operational groups themselves, they may have guidelines for the kinds of groups they are willing to support and this is worth checking at an early stage.

An Operational Group is meant to be 'operational' and tackle a certain practical problem or opportunity, a 'need from practice', that may lead to an innovative solution. Therefore, Operational Groups have to draw up a plan that describes their specific project and the expected results. Operational Groups also have to disseminate the results of their project, in particular through the EIP-AGRI network.

There are two different types of funding for operational groups. The first is for bringing the group together and planning its work, the second is for supporting the project that the Operational Group has decided to tackle. Funding to prepare the project provides more flexibility, can encourage more interest in Operational Groups, and will result in better-planned projects that generate outcomes of higher quality.

By using the setting-up funding first, Operational Groups should be able to research what is already known about the problem/opportunity and work out how they can bring added value by doing the project. They can also use it to develop partnerships and draft cooperation agreements. In this way, they will be able to start with the ideal mix of actors who can bring in the specific knowledge needed for the project (practical, organisational, scientific knowledge, etc.) and can help to implement the results widely (e.g. multipliers, facilitator).

Some Member States see this funding as a kind of seed money or preselection, which allows them to pay only for the very best Operational Group projects and saves money.

During the setting-up of Operational Groups, a plan for the dissemination of results will have to be prepared. Communication planning is absolutely vital since these groups are using public funding and are meant to produce public knowledge freely available to all.

Source: EIP-Agri website https://ec.europa.eu/eip/agriculture/en accessed 31/08/2020

6.1.2. Securing farmer participation in result-based carbon farming schemes

a. Scheme design

The design of the scheme is likely to be the most important factor in securing and retaining farmer participation.

One of the advantages of involving farmers in the development of a scheme is that they will be able to advise on what features of the scheme are likely to encourage participation and what features may act as barriers.

Some of the features of a scheme that might make farmers unwilling to participate in it are mentioned at the start of this section of the guidance. The case study on managing soil organic carbon on grasslands (Annex V) identified some features likely to encourage participation and these are listed in Box 28. They are based on a study of the Burren Programme in Ireland, but have much wider applicability.

There are some tensions between the features listed in Box 28. Flexibility is a major potential advantage of 'pure' result-based schemes. Unlike in action-based schemes, there is no need to specify the actions that farmers should and should not be taking, nor is there a need for intrusive systems of control and verification of these actions. However, if ex-ante rewards are also to be offered, this will involve some departure from a pure result-based approach. As pointed out in the guidance on reward timing in section 5.5.1, any decision to provide such rewards is likely to bring with it the need for some element of verification that actions have been taken.

Box 28 Features of a result-based carbon farming scheme likely to encourage and retain farmer participation

Early recognition of efforts. It takes a long time before results can be verified. For this reason, it is important to recognize, and award, the efforts made by the farmers. The scheme should reward farmers not only for concrete results, but also for taking the decision to change towards enhanced agri-environmental practices, as well as for the actions and management changes before the desired end result can be verified.

Simple plans and agreements. Plans prepared as part of contracts with farmers should be visual and simple, relevant and relatable.

Simple reporting requirements. Reporting should not be an excessive administrative burden for the farmers, though they should have some involvement in it.

Flexibility of approach. Giving farmers the freedom to choose the most appropriate management and changes of practice when deciding how to reach agreed climate mitigation and wider sustainability results.

Free advice. Free access to advisory services from an authoritative and trusted adviser, but this must be advice, not direction. The farmer must still feel in charge.

A **supportive ministry or agency**. Farmers need to be assured that participation in the scheme will not prejudice other forms of agricultural support or put them in breach of any rules or regulations.

Systems that reinforce trust and reliability. Any system of penalties that is necessary to ensure compliance and prevent abuse of the scheme needs to be seen to be fair and to be fairly applied. An appeal scheme may be needed to resolve disputes. Administrative systems also need to be robust and reliable, ensuring that farmers receive timely and accurate payments.

Source: Based on research into the Burren Programme by COWI et al., 2021 (Annex V), with some additional material

Scheme developers will need to balance the extent to which a 'pure' result-based scheme is adopted, with the 'freedom to farm' that it gives, against farmers' dislike of the uncertainty and delays to payments that go with it. As mentioned previously, providing a separate non-result-based payment for set up costs offers at least a partial solution. In making this decision, it is important to consult the farming community and listen to their views.

b. Raising awareness

As well as making the design and operation of the scheme as farmer-friendly as possible, it may also be necessary to raise awareness of a new scheme and encourage farmers to try it.

One of the advantages of involving farmers in the development of the scheme from an early stage is that, if they are happy with the scheme that they have helped to develop, they may also be willing to act as advocates for it with their peers. Other stakeholders involved in the development process who have influence with farmers may also be helpful.

Supportive publicity for the launch of a scheme in the local and/or specialist farming media and on-line may be helpful. It is worth spending time identifying and briefing potentially sympathetic journalists, bloggers or other 'influencers' in advance of the launch.

Inviting farmers to a launch event can be helpful. The effectiveness of these events can be greatly enhanced if, as well as listening to presentations about the scheme, participants have opportunities to ask questions and discuss their concerns with those who will be operating the scheme. Offering smaller, more interactive, follow up sessions, after farmers have had an opportunity to digest the information presented at a launch event, can also be useful and is likely to be more effective than trying to concentrate everything into one day.

c. Maintaining participation

Once farmers have made a decision to participate in a result-based carbon farming scheme, they need to be supported and encouraged if they are to participate effectively. Supporting farmers with good quality advice from a source they can trust is key to this. Guidance on how to develop the capacity to provide this level of advice is set out in the following section.

It may be worth exploring whether such one-to-one advice could be complemented by encouraging farmers to cooperate with and learn from each other, using the services of a skilled facilitator to help them decide their priorities and explore the resources available to achieve them. CAP funding can again be helpful here and can be used to help fund the bringing together of these groups and employing a facilitator. A good example, albeit not directly related to result-based carbon farming, is the Facilitation Fund Group mechanism set up under the 2014-20 English Rural Development Programme to coordinate and focus the delivery of Countryside Stewardship, the agri-environment-climate measure, in a local area[31].

[31] See the UK Government website: https://www.gov.uk/guidance/facilitation-fund-2019-countryside-stewardship accessed 31/08/2020

A more imaginative approach, documented in a study for the European Commission of result-based schemes for biodiversity protection (Allen et al., 2014), is that adopted by the French *Prairies Fleuries* (flowering meadows) scheme. Complementing all the usual features of a result-based scheme is a species rich meadows contest *Concours des Prairies Fleuries*, which has increased farmer interest in the scheme as well as a sense of pride in maintaining the species-richness of the grassland. This in turn has helped to promote the scheme and its objectives more widely.

What these two approaches (*Concours des Prairies Fleuries* and Facilitation Fund groups) have in common is that, by encouraging social interaction between farmers, focused on achieving environmental land management goals, they help embed participation in environmental land management schemes in the culture of farming communities. In this way, they help to instil a sense of pride in achieving a high standard of environmental management.

6.2. Capacity building

The importance of capacity building was mentioned in section 4.2.1 where the need to build capacity for scheme design and operation were both emphasised. Result-based carbon farming schemes are complex and will require everyone involved, those developing the schemes, those operating it and the farmers with contracts under it, to develop new skills. Building institutional capacity for scheme development is dealt with in some depth in section 4.4. This section focuses specifically on building the capacity to equip farmers with skills and knowledge they will need.

All the forms of result-based carbon farming researched in the course of this project require farmers to either learn new skills or apply existing ones in different ways. Peatland rewetting may require farmers to learn how to maintain high, stable water tables. Agroforestry schemes may require them to learn how to integrate timber or fruit production with arable cropping, or may require them to re-learn the skills involved in managing traditional silvopastoral systems. Other types of schemes may require farmers to learn how to apply current techniques for minimising GHG emissions from livestock systems and/or how to maintain and increase soil carbon levels under arable grassland or mixed farming systems. They may in addition need to learn how to market carbon credits to buyers, though most schemes relieve them of this by acting as intermediaries on their behalf.

Because of the unfamiliarity of many of the techniques involved in result-based carbon farming, access to good quality advice from a trusted source is particularly important for securing scheme uptake amongst farmers and for enabling them to achieve the intended results.

A particular challenge for those developing result-based carbon farming schemes is likely to be building the advisory capacity to provide this advice, especially when it is likely that a scheme will potentially be available to large numbers of farmers. Advisers are likely to need to have a range of knowledge that is both wide and deep, encompassing the practical detail of the farming system(s) involved, an understanding of the processes that can be used to reduce GHG emissions and or promote GHG removal, a good grasp of the economics of both farming and the carbon markets. They are also likely to need an understanding of and empathy for the culture of the farming community in the area. For most schemes there are unlikely to be enough ready-made advisers with the necessary skills.

A consistent message from across the case studies is that scheme developers need to consider how to develop their advisory capacity. They will need to do this early in the scheme development process, as the process of recruiting and/or training advisers takes time.

There are a number of ways of providing the necessary advisory capacity. One approach is exemplified by the pioneering Burren Programme in Ireland, which was researched for the case study on managing SOC on grasslands (Annex V). This very localised programme took a farmer-centred approach from the start and established a local Burren Programme office in the community with local staff, ready to engage with farmers and always available for dialogue, listening and giving advice. This was very important in building and maintaining the engagement of farmers with the programme and also helped provide a bridge between the farmers and the public authorities, overcoming a degree of mutual suspicion in the process.

Direct recruitment and or retraining of advisory staff by scheme developers/operators can also work for larger schemes, even though it is sometimes hard to convince government bodies to adequately resource what is often seen as an 'overhead'. Recruitment may also be difficult as some of the 'soft' skills, such as an understanding of the culture of local farming communities and sufficient understanding of local farming systems to gain acceptance and credibility, take a long time to acquire if individuals do not already have them.

One way of containing these costs is to supplement the efforts of full-time advisers by developing and using 'lead farmers' to provide field walks, demonstrations and one-to-one advice to their peers. The case study on managing SOC on grasslands (Annex V) found several schemes that had done this.

Using lead farmers has a number of advantages, which are listed in Box 29.

Box 29 Advantages of using lead farmers to help provide advice to farmers participating in a result-based carbon farming scheme

- There is no long term financial commitment as with directly employed staff. Lead farmers can be treated as contractors rather than employees. They can be paid for the work they do through the budget allocated for payments to farmers, rather than through the budget for the operating body's costs.
- Their costs are in consequence less likely to be seen as overheads by budget holders, administrators and politicians.
- A farmer who is well respected in their locality is more likely to persuade other farmers to adopt something new than an outside adviser.
- The effort put into training and supporting lead farmers is likely to leave a permanent legacy of skills and knowledge in the farming community that may well last long after the scheme has ceased operating.

Another way of containing the employment issues and recruitment difficulties of providing an advisory service of sufficient depth and quality is to form a partnership with an existing agricultural extension service early in the process of developing the scheme. If this service works on a commercial basis, this could be a costly option, but it would at least avoid all the complications of directly employing and training staff.

COWI et al. (2020) also found examples where scheme owners had formed a partnership with a body that was willing to pay some or all of the costs of the advice and training required. Three schemes, i.e. *Ferme Laitière Bas Carbone* (FLBC), Carbon Action and Healthy Soils for Healthy Food are either run by the private sector or rely heavily on the cooperation with private sector food processing or retail companies for providing finance for carbon farming training. In addition to this, FLBC cooperates with agricultural schools and experimental farms and Carbon Action ensures that farmers are involved in deciding on training structure and content.

Many farmers do already pay some advisers themselves, especially agronomists, and another possible route to capacity building would be to form a partnership with a professional body that represents advisers, agree the standards required and leave the professional body to organise the training. Advisers would be incentivised to participate by the prospect of a new market for their advice. The problem with this approach is that the studies done have all showed that requiring farmers to pay for the advice they need to participate in an environmental land management scheme of any sort is likely to be a major obstacle to scheme uptake.

As mentioned in section 6.1.1, farmers can also be helped to develop new skills for themselves by encouraging the formation of facilitated groups of farmers. These still need funding, as facilitation is vital to their success, and additional skills are needed for successful facilitation on top of those needed to provide one-to-one advice, but there is potentially a good multiplier effect.

Schemes that are looking to minimise costs sometimes decide to rely mainly on 'one-to-many' forms of guidance such as on-line reference material or published handbooks. These can be very useful in combination with more personalised advice, but experience has shown that, even for relatively simple 'entry level' schemes they rarely work well if this is the only source of advice available.

For something as complicated as a result-based carbon farming scheme, exclusive reliance on one-to-many forms of advice for farmers is not recommended.

6.3. Transparency

COWI et al. (2020) defines transparency in the context of result-based carbon farming and forestry schemes as the extent to which information on an emission reduction activity is accessible and disclosed to the public. This includes information on and rationale for methodologies and assumptions applied in setting up baselines and MRV systems and used in establishing the emission reductions.

The schemes researched for COWI et al. (2020) took a variety of approaches to transparency. Some, including the German MoorFutures scheme, were very open with individual project development documents, monitoring and verification reports all publicly available.

Other schemes restrict access to documentation on individual projects or agreements, but make details of their methodologies publicly available. Examples include the Australian Emission Reduction Fund and California's Carbon Offset Program schemes. Quite a few of the schemes looked at had no clear-cut policies to ensure transparency.

This disparity of approaches seems to reflect the difficult balance that scheme owners have to strike between the need for transparency to boost confidence in and support for schemes and the need not to disclose commercially sensitive information and to respect the privacy of individual farmers. If farmers are unhappy with the type of information being made public, this could become a barrier to uptake of the scheme.

In the case of schemes selling tradeable credits to the compliance markets, the transparency requirements are likely to be determined at least partly by the requirements of the regulations under which the compliance market operates. Where an independent body is responsible for verifying the credits, it is likely to insist on full access to detailed information at both the scheme and individual agreement/project level. It may or may not decide to make this more widely available.

The case study on peatland restoration and rewetting (Annex I) recommends public credit registries to record verified credits and any subsequent trade in them. They recommend that such registries should include non-commercially sensitive documentation, clarification of property rights, certification and results of the scheme, but without disclosure of private information. One reason for recommending this level of transparency is the need to ensure that credits are not accidentally or deliberately double counted. A summary of the approach taken by the MoorFutures project is given in Box 30.

Box 30 The approach to transparency when selling carbon credits taken by the MoorFutures project

Credits sold by MoorFutures are explicitly linked and attributed to specific projects that can be visited on site. For every project, clear and accessible documentation is available with information on location and status of the project area, as well as on the assessment of emission reductions and additional ecosystem services. MoorFutures are registered at the regional level through regional coordinating bodies – e.g. in Mecklenburg-Western Pomerania and Brandenburg by the relevant Ministries.

Source: Joosten et al. (2015)

In the case of schemes selling voluntary offsets, wider transparency is particularly important. The voluntary offsets market is something of a buyers' market and, to secure good prices, schemes have to have a good reputation for integrity and may often need to demonstrate that they can deliver co-benefits in a way that has local relevance. The greatest possible degree of transparency is a useful way of achieving this. The case study on peatland restoration and rewetting (Annex I) recommends that peatland schemes should publish all their methodologies and best practices and should work cooperatively with external stakeholders. The case study also recommends conducting stakeholder consultations during the project development, as another exercise in transparency that can further enhance stakeholder and farmer acceptance.

Publicly funded schemes have to strike the same balance between the individual's right to privacy and the public's right to know how taxpayers' money is being spent. Much of this will be determined by national legislation and may vary between Member States. For schemes where payments to farmers or landowners are made through the Common Agricultural Policy, Commission Regulation (EC) 908/2014 requires the operating authorities to publish details of the amounts paid to CAP beneficiaries. Data has to be published for all beneficiaries on a searchable website, and must include the name and locality of the farmer/land manager and details of the amounts and schemes for which subsidy has been paid. However, for those receiving less than the equivalent of €1,250 in subsidies, the name will be withheld. A much wider range of data will also need to be shared with bodies operating other CAP-funded schemes so that the necessary cross-checks can be carried out.

Transparency is essential to boost the confidence of regulators, customers, stakeholders, politicians and the wider public in the validity of the climate mitigation and other benefits claimed by the scheme. The need for transparency needs to be balanced against respect for commercially sensitive information and for the privacy of individuals. As a minimum, full details of all methodologies need to be publicly available and, where carbon credits are being traded, there needs to be a publicly accessible registry. Specific rules apply to CAP-funded schemes.

7. Facilitating the development and adoption of carbon farming schemes in the EU

Several factors can facilitate the interest in carbon farming schemes, their development and piloting, and ultimately their uptake by the farming community.

Policy context

Demand for schemes and any offset credits they produce are driven by high-level policy decisions, particularly in regard to national, EU, and international climate ambition. For the development of offset credits, Member State and EU policy decisions regarding the eligibility of different offset credits to meet climate obligations in different sectors and across borders will be crucial. Policy makers can also support wide-spread deployment of result-based carbon farming schemes by creating demand through public policies. For example, result-based targets could be encouraged through eco-schemes or other agri-environmental measures in the CAP, public procurement policies could favour products produced using demonstrated climate-friendly production, or consumer demand for climate friendly production could be supported through consumer information labels or other support for food supply chains or bio-economy sectors.

The EC Farm to Fork Strategy[32] reflects the potential for policy to support a fair, healthy and environmentally friendly food system. Published in May 2020, the Strategy proposes that farming practices which remove CO_2 from the atmosphere and contribute to the EU climate neutrality objective should be rewarded, via the CAP or through other public or private initiatives linked to the carbon market. Robust certification rules for carbon removals in agriculture are the first step to enable farmers to sell certificates to private companies. The EC will develop a regulatory framework to monitor and verify the authenticity of carbon removals in agriculture (and forestry)[33], providing an additional incentive (on top of CAP payments) for carbon farming. A new EU Carbon Farming Initiative to be launched in 2021 will promote this new business model. A platform for exchange of experiences and mutual learning around the development of result-based carbon farming schemes could be part of such initiative, and could facilitate scheme development.

Moreover, result-based carbon farming schemes have the potential to be in close alignment with the EU Sustainable Finance Taxonomy, which could further provide incentives for investments in the area. Together with the evolving climate policy in the EU, this policy context provides increasing and stable impetus for climate action in the EU agriculture, including through certainty offered to investors and pressures on emitters to deliver reductions.

Experience of result-based payment schemes for farmland biodiversity has shown the value of a Europe-wide network or platform for scheme developers to learn from others' experiences, share best practice and provide mutual support in solving some of the challenges of scheme design, implementation and evaluation[34].

Farming practices and systems with carbon farming potential

[32] COM(2020) 381 final
[33] As announced in the Circular Economy Action Plan COM/2020/98 final.
[34] See for example this LIFE funded network https://www.rbpnetwork.eu accessed 6 November 2020

The carbon farming approaches reviewed in this study all have significant potential to reduce net GHG emissions and/or increase carbon sinks, at different intensities and scales. The extent of the climate mitigation benefits and other co-benefits is highly dependent on targeting and tailoring to local opportunities and needs. The heterogeneity of soils, climatic conditions existing management practices and existing carbon stocks means that the extent to which the potential for climate mitigation is actually realised can vary significantly at farm and plot level. In this context, improved assessments of mitigation and sequestration potentials at more granular level (in specific contexts) would facilitate the targeting of schemes and their likelihood of success.

Significance of co-benefits

All of the case studies identified the additional co-benefits provided by the carbon farming schemes reviewed. Factoring these into the delivery of the scheme, and rewarding farmers for delivering specific co-benefits will be an important element of upscaling carbon farming, as this will increase incentives for farmer participation. This will also ensure that farmers implement climate actions that deliver climate impact without negatively affecting other societal priorities (e.g. water quality, biodiversity conservation, climate adaptation, etc.).

Co-benefits are also attractive to farmers. For example, the case studies found that some climate actions increase soil functionality, decreases costs, increase resilience to climate change, and diversify farmer income streams. These multiple benefits can be significant and convincing to farmers. For example, the case study on livestock farm carbon audit (Annex IV) found that the efficiency impacts of climate actions could reduce farmer costs significantly, and that these reduced costs would be greater than the expected income that would arise through selling carbon offsets. From a farmer perspective, these co-benefits can be more important than the climate impact, and can support targeting farmers to increase uptake.

Seizing opportunities and overcoming barriers

There are clearly opportunities to upscale the implementation of carbon farming schemes throughout the EU. The exception is peatland restoration and rewetting, which is limited to those areas of the EU with peatland agricultural soils, but giving priority given to result-based carbon farming in peatlands can be justified by the huge potential climate benefit per unit area.

There are however significant barriers to be overcome in the short-term. These include costs and resource requirements of developing new result-based payments for carbon farming and ongoing MRV; the timescale and institutional capacity required to do this at scale; the lack of robust verification standards for some options (notably SOC) and, most importantly, the need to overcome farmer resistance to adopting new and possibly unfamiliar practices which often require significant initial investment and have a much longer payback period than most agricultural enterprises.

As identified in COWI et al. (2020), to surpass these barriers, ongoing research, practice, and knowledge exchange will be crucial. Continued scientific research, especially into MRV of climate actions, is needed to reduce uncertainty and to lower the cost of MRV. Knowledge exchange should aim to share lessons and experiences of existing schemes with others. It can be in the form of workshops, case studies, or reports on schemes. These activities should involve scheme administrators, as well as farmers and other stakeholders. Generally, high levels of transparency will support mutual learning, as well as build trust between scheme participants and scheme owners. Training and increasing awareness are also crucial first steps for establishing carbon farming schemes. In particular, given the relative novelty of some of the climate actions, it is crucial to recruit knowledgeable farm advisers, who can facilitate farmer training and outreach as well as implementation. If schemes propose drawing on external auditors or certifiers, these too must be trained. Finally, despite barriers and uncertainties, it is crucial that the EU continues to gather practical experience implementing carbon farming schemes. As shown in the case studies, practical experience can identify new barriers, catalyse new solutions, and develop invaluable lessons that can then be applied in subsequent schemes.

Farmer and other stakeholder involvement supports the design of effective schemes, as well as supporting two-way knowledge sharing and outreach. Farmers and other stakeholders (such as farm consultants, banks and credit buyers) should be involved in the design and implementation of new schemes to encourage co-ownership and buy-in. Collaborative research projects and local pilots can prepare the ground for later upscaling, as well as serving as a testing ground to develop and improve new schemes with input from stakeholders.

Result-based, action-based or hybrid schemes

There is clearly an inherent tension, at least in the short to medium term, between the need to upscale rapidly the widespread adoption of carbon farming across all farmland in the EU to meet climate targets, and the immaturity of result-based payment schemes for carbon farming and the carbon markets available to farmers. Clearly developing and piloting a range of locally or regionally tailored result-based pilot schemes for carbon farming is an urgent priority, but that will take some years. Therefore, it will be necessary to focus also on more widespread adoption of well-designed, action-based or hybrid schemes, to make the initial step towards a real shift in the agriculture sector’s contribution to EU climate targets. This will support later uptake by increasing awareness and knowledge of farmers, as well as that of farm advisers and other stakeholders.

Overall, the case studies suggest that **peatland restoration and re-wetting** and **agroforestry** represent the two carbon farming approaches that are arguably the most mature and ready for developing and testing a large-scale result-based carbon farming mechanism in an EU context.

Peatland restoration and re-wetting will only ever affect a limited area of land, but within those areas it can deliver considerable savings in GHG emissions with useful co-benefits. There have been exploratory projects in Finland and the UK, and there is at least one mechanism (MoorFutures) that has been operational in the EU since 2010, gaining considerable operational experience.

Agroforestry provides less carbon storage per hectare, but it has the potential to be deployed across a much larger area of farmland across the EU. If well designed, agroforestry can provide very valuable co-benefits. Traditional forms of agroforestry and the retention and establishment of woody landscape features can already be supported by the CAP through a mixture of regulatory requirements and action-based payment mechanisms. There are also a number of projects underway to develop result-based mechanisms for new forms of agroforestry. It also has a useful range of co-benefits.

The huge area of **grassland** in the EU, and the existence of many existing result-based grassland management mechanisms, mean that it is also worth exploring how a carbon farming element could be incorporated into these schemes to maintain and enhance SOC. However, it may not be practical to adopt a pure result-based approach in grasslands, because of a range of challenges related to the measurement of climate benefits and the long timeframe required to ensure permanence.

The scale of **livestock farming** in the EU suggests that livestock farming carbon audits also have the potential for large-scale deployment, but such mechanisms will need to tolerate the moderate levels of uncertainty associated with current farm carbon audit tools. In addition, these mechanisms must avoid supporting and therefore locking in high emissions food production methods on land that could be more efficiently used.

It is a somewhat similar picture for mechanisms based on soil **carbon maintenance and sequestration in mineral soils**, though the problems of uncertainty are even greater in this case, as well as the issues of permanence and risk of reversal. There has been a surge of initiatives focused on SOC in recent years and methodologies to measure soil carbon retention and sequestration are being developed to increase certainty and decrease MRV costs.

8. Summaries and recommendations of the carbon farming case studies

8.1. 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 unsustainable land management practices have resulted in peatland degradation limiting their ability to provide effective climate regulation services. Currently, degraded peatlands emit 2 $GtCO_2$/yr, and are responsible for almost 5% of global total anthropogenic CO_2 emission. From peatland drainage alone around 220 $mtCO_2$ eq. are emitted in the EU per year[35]. Restoration, rewetting and conservation of peatlands are promising carbon farming options due to the high-level potential climate benefits per hectare of peatlands, while ensuring the provisioning of other ecosystem services[36]. However, the use of result-based approaches and schemes for supporting peatland restoration and rewetting are currently limited and wider adoption and upscaling are needed.

Case study's aim and scope: Results-based carbon farming schemes 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 confined emission sources based on current carbon credit prices. The case study focuses on avoid emissions from peatlands through peatland restoration and rewetting. Emissions from grazing livestock on drained peatlands is within scope to the extent that this as an eligible activity for crediting.

Box 31 Recommended peatland restoration and rewetting scheme – a summary

Objective: Incentivise restoration of peatlands through mobilisation of carbon finance payments for the avoided emissions.

Scale/coverage: Considering foreseen CAP support, a peatland carbon farming scheme is only viable where full restoration of peatlands on already degraded marginal agricultural land is possible. Minor changes to water table and partial rewetting without restoration can be considered but will most likely not yield sufficient credits for a competitive return on land and business case. The MS specific implementation of the restrictions for ploughing and drainage of peatlands (under GAEC 2) is decisive for the business case of many peatland projects.

Climate actions: For a start, a scheme should target avoided emissions of CH_4 and CO_2 resulting from restoration of water levels and vegetation. While undisturbed peatlands constitute a continuous carbon sink, it is considered non-anthropogenic by

[35] Source: Greifswald Mire Centre (2019).
https://www.greifswaldmoor.de/files/dokumente/Infopapiere_Briefings/202003_CAP%20Policy%20Brief%20Peatlands%20in%20the%20new%20EU%20Version%204.8.pdf
[36] Source: Joosten et al., (2016).
https://assets.cambridge.org/97811070/25189/excerpt/9781107025189_excerpt.pdf

most standards and hence not an eligible activity. The build of the carbon stock in the period immediately after restoration takes 20-50 years and is initially hardly measurable. Until data and measurement systems can detect this build up, the carbon removal part of peatland restoration is not recommended as basis for crediting.

Design principles: There are different go-to-market models that can be applied, depending on the nature of the potential link to what market or type of buyers and the role and responsibilities that farmers, the scheme administrator and governments are willing and able to manage. If a scheme is created to provide offsets for national 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 much smaller set up can be operated and driven by a group of researchers, leaving limited administrative and project development work on farmers. However, with the rising attention of governments and the EU on the potential for peatland restoration as a GHG mitigation measure, the framework conditions that shaped the existing schemes may change, and new designs must be developed.

MRV: It is not possible or necessary to conduct on-site, continuous monitoring producing primary data as emission factors are well correlated to water table, land use and vegetation. Therefore, most schemes must rely on monitoring of indicators, while relying on baseline data from trials and surveys in similar climatic settings. Reporting and monitoring can be conducted at project level or by the scheme to save costs, however verification should always be entrusted to third party 'peatland expert' verifiers approved by the scheme. All MRV data including site specific emission factors and activity data should be made public and available to scrutiny through e.g. scientific publications, as this will add an additional level of trust and review.

Rewards: Peatland rewetting and restoration deliver many benefits in addition to GHG mitigation. However, GHG benefits are recommended for crediting. Many buyers will pay a price premium for the higher quality and additional co-benefits of peatland credits, in particular if these originate from a site in an area of commercial relevance to the buyer. This is so even if the co-benefits are not quantified and verified. Any new peatland carbon farming scheme would be recommended to focus on GHG benefits until experience and methodologies from existing scheme on quantification and monetisation of co-benefits can be adopted.

Funding and governance: In the pilot phase and considering current credit price levels, any new scheme must rely on other complementary sources of funding than carbon market finance from sale of offsets or credits. Cash flow will be an issue for most landowners participating in a peatland carbon farming scheme, so upfront funding is crucial. Switching to ex-ante crediting to raise climate finance upfront cannot be recommended as most compliance schemes does not allow this practice. However, some hybrid models using carbon credits as instalments on zero interest loans are being explored and may prove feasible.

Overarching considerations: Provided that a given MS or region would naturally host several extensive peatlands, the feasibility of a peatland carbon farming scheme should be considered upfront and focus on a few key issues such as profitability of marginal agricultural land on drained peat soils, availability of country specific data on peatlands (activity data and emission factors) and interest of farmers and private investors. Where these elements are conducive and information available, a feasibility assessment could be initiated.

Recommendations regarding scheme design

Scope and coverage. The main objectives of the peatland schemes should be rewetting and restoration of drained peatlands in order to secure climate mitigation objectives. The rewetting and restoration of peatlands comes with numerous co-benefits linked to ecosystem services including nature, biodiversity and water protection. However, the quantification and monetization of these benefits is not a pre-requisite for a successful scheme. It is recommended to target a peatland carbon farming scheme at marginal and drained agricultural land on peat soils and target full rewetting and restoration or appropriate paludiculture as main eligible activities. For piloting or to reduce implementation time for frontrunner projects, the scheme should also target potential restoration projects where few landowners are involved and where partial or full public ownership is existing or possible.

Scheme feasibility. Any potential peatland project must first identify the presence of a peatland layer currently subject to drainage but preferably with a thickness of more than 50 cm. Without an exposed peat layer or a very shallow peat layer a project or scheme is not feasible. In order to identify/screen for suitable sites the land use and land profitability must be considered following a three-pronged approach:

- To identify soil types, soil maps or landscape models must be used. Presence of histic soils is a prerequisite, but presence of current drainage (pipes or ditches) is also needed.
- To identify land use, maps, agricultural statistics and/or satellite and drone imagery can help, but it requires Geographic Information System/Remote Sensing expertise for data preparation and interpretation. Relevant authorities should be involved early on.
- To screen for sites with a potential business case for restoration or rewetting, land profitability must be estimated (including current CAP payment entitlements). It will take simple economic modelling to determine the total carbon financing that would ensure sufficient funding of a restoration project. Specifically, density and amount of avoided emissions and various pricing scenarios can then help determine the extent of possible sites with a positive business case.

Before setting out for mapping and assessment of vast areas it should be noted that for many non-boreal geographies, peatlands are few and far between. Experts will be able to determine peatland from landscape analysis and simple rainfall and groundwater data. Applying nationally relevant emission factors (EF) will then allow for initial estimates of GHG potential from carbon farming. It is recommended to analyse 3-4 larger peatland restoration areas, which are commercially viable for a full restoration. The analysis should include, as part of a feasibility study, economic considerations including potential pathways, areas, and price levels, as for the Peatland Code (PC).

At a later stage, within the governance and operation of a scheme, individual project level development of restoration and rewetting will require detailed high-resolution mapping and assessment of parameters such as soil type, vegetation, water regime, including rainfall and groundwater dynamics. This is specialist work requiring researchers or technicians.

To support the early phase of scheme design, investors and regional or national governments should consider setting up a dedicated carbon fund that could provide guarantees for projects that receive advance payments and provide inputs to setting up a market platform. The carbon fund can be designed in several ways as explained in more detail under markets considerations later in this guidance. A public-private-partnership carbon fund may serve this purpose and guarantee the first three years of credits at a fixed price, with permission to sell on/transfer credits.

Additionality and carbon leakage 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. In many cases, the additionality of a restoration project can be determined by an assessment of its profitability in the absence of climate finance but with the access to CAP pillar 1 payments. Carbon leakage cannot be standardised other than through a minimum percentage of carbon leakage calculated as a deduction of the impact quantification as is used in some standards, and it is necessary to account for carbon leakage on a project-specific basis (von Unger et al., 2019).

As concerns permanence risk, it is recommended to apply ensure use of long-term land contracts, use land deeds actively and other legal measures. This should be combined with mandatory buffer accounts to guarantee issued credits. Existing peatland schemes set a low (10-30%) buffer account.

Governance structure: The scheme should be governed by a secretariat and supported by a technical advisory committee and a stakeholder or steering group inviting in farmers, investors, authorities and interest organisations. The technical advisory committee of experts and researchers should actively guide and support the e.g. development of rules, practices and standards for baselines, additionality, risk buffers, MRV and insurance pricing and sale of credits.

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 scheme is developed in the context of a Rural Development Program or supporting CAP implementation, scheme level indicators will be needed to be devised in close coordination with relevant authorities. 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.

Co-benefits and sustainability indicators

If possible, one, more or all co-benefits should be quantified and monetised to allow for charging a price premium. There are two options for monetising co-benefits, and both can be applied:

- *Bundling* is grouping multiple ecosystem services together in one complete package to be sold as a single credit. This option might be useful if only one ecosystem service can be commodified. However, additional ecosystem services could allow for charging higher premium prices.
- *Layering* refers to a scheme where payments are made for several, distinct ecosystem services which are then sold separately. Layering in only possible where ecosystem services can be commodified individually and where a market demand exists. Layering should however be carefully quantified to avoid potential double-counting.

Monitoring, Reporting and Verification (MRV). It is not feasible or cost-efficient to measure data on-site in the restoration area in real time for all indicators continuously, so schemes would have to rely partially on modelled data, spot checks and reference data. These data should be obtained from inventory operation, local researchers and other projects.

A core project-level indicator will concern avoided emissions and sequestered carbon; therefore, emission and removal factors must be established early on. Defining so called default factors will be a key responsibility of the technical advisory committee (covered under governance). This process should be open and inclusive and ensure the assessment and evaluation of data and factors used nationally for peatlands (or used internationally in geographies with similar climate and landscape).

- Emission and removal factors should be determined for each land category and for each peatland *state* within each land category.
- Emission factors could be determined by using proxies or reference data and supplemented by direct measurements in the project areas. It is suggested that best practice would be to publish the research behind proposed emission factors as a scientific paper in a peer reviewed journal, in order to have scrutiny and transparency.
- For early, pre-EF assessments, scheme owners can assume an annual peat decomposition rate of 1 cm.

It is recommended to consult the NIR and the submitted reporting tables (CRF tables submitted to the UNFCCC) to identify approaches, maps and data used, classification of soils and use of emission factors. Also, data should be shared for modelling purposes e.g. at EU level.

Lastly, it is recommended to strive for consistency in data approaches, classifications applied, and in annual work cycles between national inventory makers and scheme owners. There are currently no rules or guidelines in place within the EU or internationally that supports establishing exchange of data, however by 2023 the European Commission will release a standard for Carbon Removals which may address some of these issues. In general, scheme owners should observe policy developments in the EU and abroad on this matter, and encourage domestic inventory compilers to proactively address the issue.

In order to quantify results, the monitoring system should be constructed to match the selection of result indicators and the metric for estimating and reporting results. Matching monitoring systems and result indicators is an exercise that requires technical expertise, but it is key to a functioning scheme.

Monitoring indicators should be developed for monitoring peatland rewetting and restoration projects. The Greenhouse Gas Emissions Site Type method is the most developed indirect technique (by the researchers behind MoorFutures but also applied with modification by other peatland initiatives and schemes) to quantify GHG emissions.

Regular evaluation, reviewing and improvement of the scheme to assess progress towards objectives and improvement of the peatland scheme are recommended. This scheme evaluation, which is quite separate from the scheme’s MRV system, could focus on impacts, effectiveness, practical feasibility, efficiency, equity and sustainability of a peatland scheme, or adapted to other carbon farming schemes.

Reward. It is recommended to quantify and monetise avoided CO_2 and CH_4 emissions as the basis for calculating the reward to the landowner. In addition, it can be considered to map and document non-carbon benefits in order to add mark-up on price compared to European emissions allowances or voluntary markets.

The unit price will usually be higher than market prices for allowances and existing initiatives that have either applied cost-based pricing or relied on project specific price negotiation between project owner, developer and buyer (which allows for factoring in a price premium for non-carbon co-benefits). If there is little compliance demand and no transparent and free markets setting prices, it is recommended to use one of these two approaches. Pricing of voluntary market units (Verra, REDD+) may be used as inspiration or benchmark, because some buyers will compare European peatland restoration credits to credits available from these schemes.

Markets and payments considerations. Taking account of questions such as who owns, issues, markets, prices, transfers and uses the generated credits constitutes market design and should be carefully assessed as peatland credit markets are still few and nascent, and the credits are not yet accepted at compliance markets regulated under UNFCCC rules or EU legislation. The recommended approach to market design is outlined in the scheme platform model (model 1, see case study) which entails projects that are developed by and later run by the scheme owners on behalf of the landowners. As scheme owners in this model are actively involved in all decision processes alongside the deployment of accredited developers where necessary, the model allows for the simplest decision-making process as well as providing the highest level of flexibility for expansion. The model is particularly well suited to small-scale and early testing in a situation with limited upfront funding and restricted access to carbon markets. In more regulated environments, where peatland restoration can already contribute to GHG target compliance, the other presented models are better suited.

As part of market design, buyer restrictions should also be considered in view of potential reputational, integrity or price setting implications. Restrictions could be on:

- An important market restriction is recommended for on-sale/trading of units, unless a national and linked registry exists.
- Restrictions may also target certain types of buyers (per sector, industry, geography).
- Conditional access to credits should be based on merit. Conditionalities could, for example, prevent any company with unabated emissions from owned, leased or in-supply chain wetlands from acquiring units.

Considering the above, it is recommended to start with targeting potential buyers with local presence or commercial interest in peatlands or rural landscapes, e.g. global/foreign companies with branch offices/clients in the area, or food, outdoor equipment, timber or tourist businesses.

The common and well-established practice of carbon markets is to tie the **payment** to the issuance and subsequent transfer of the credit from the project owner to the buyer. However, it is recommended to consider both ex-ante and ex-post payments/crediting in the design phase but only to apply ex-ante if tied to low interest upfront loans without instalments where credits constitute payback. Also, this approach may exclude credits from national or international voluntary or compliance markets. To link markets and compliance schemes, it is necessary to prepare and test ex-post crediting.

Farmer engagement, training and advice. Farmers (and landowners) should be engaged more to ensure increase buy-in and take-up. Key elements include creating economic incentives for farmers/landowners by ensuring that peatland rewetting and restoration is more profitable than the status quo and could be presented as a new component to their business. Training and advice to farmers should be provided that facilitate farmer learning, capacity building and business opportunities. Further, training for accredited entities or companies conducting validation and verification procedures should be scaled up to address the limited number of such entities capable of conducting such procedures within peatland.

Promoting CAP alignment. It is recommended to explore options for alignment between peatland restoration and rewetting schemes and the CAP, to ensure adoption, upscaling and enhanced monitoring of the peatland schemes. Several options could be explored including (i) potential phasing out of CAP direct payments for drained peatland to ensure coherence between agricultural, peatland and climate policies; (ii) guarantee that farmed wet peatlands (e.g. used for paludiculture) are eligible for CAP payments from Pillar 1 and Pillar 2; or/and establish result-based CAP payments schemes promoting climate mitigation benefits and provision of ecosystem services by setting attractive incentives for both carbon and non-carbon co-benefits.

Overall conclusion on peatland restoration and rewetting: 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 scheme 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 scheme and programmes in the EU can facilitate scheme development and upscaling in the EU.

8.2. Agroforestry

Context**:** 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 the potential of agroforestry 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 tC per year (7.78 and 234.85 million tCO_2eq per year). The type of agroforestry adopted will affect both the sequestration potential and the contribution of agroforestry to mitigating other environmental pressures (Kay et al., 2019). Agroforestry can take more time to deliver GHG benefits than other interventions (IPCC, 2019b), and the permanence of the carbon sequestered depends on the type of trees and their end use. Agroforestry systems are also at risk of re-emission associated with poor management and natural events.

Case study's aim and scope: Result-based payment schemes 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.

Box 32 Recommended agroforestry scheme – a 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.

Monitoring, reporting and valuation (MRV): Only indirect methods are feasible 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 schemes for agroforestry.

Typical project steps include:

- **Step 1a**: for 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**: for 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 an agroforestry system that meets long-term climate and other environmental objectives, and identify 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 being evaluated 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.

Learning from existing projects and methodologies:

Overcoming farmer resistance adopting new agroforestry: with the exception of a few Member States (notably France), there has been very limited interest among farmers with little or no experience of agroforestry. 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 they are not taken fully into account in many Member States' rural land use policies or definitions of land eligible for CAP direct payments.

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 than the one in charge of agricultural policy, especially when agriculture and forestry responsibilities are separated at government level.

Learning from existing projects: scheme 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, have potential for the introduction of locally appropriate agroforestry systems. Member States should ensure that their definitions of CAP direct payment eligibility rules include land occupied by long-established pastoral agroforestry systems, new agroforestry systems and woody landscape features.

Farmer engagement and advisory support: key elements are actively engaging farmers in the scheme 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: Schemes need to aim for environmental additionality (enhanced carbon sequestration over the long-term that would not have occurred in the absence of the scheme), regulatory additionality in that project activities go beyond the legal baseline (e.g. retention of existing trees and other woody features) and financial additionality (meaning that without the scheme rewards, including those for the provision of environmental public goods, the costs of the action would outweigh the benefits).

Result 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, scheme designers should consider several options. These can also be seen as stepping-stones through which the scheme 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 schemes/certified credits: farmers are paid solely for the measured or modelled 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 scheme based on adapting exiting verification standards might be developed e.g. by adapting the Woodland Carbon Code.

Overall conclusion on agroforestry: 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 schemes 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.

8.3. Maintaining and Enhancing Soil Organic Carbon (SOC) in 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 58 mtCO_2eq per year (Lugato et al. 2014). Furthermore, maintenance of existing SOC levels is crucial given that many mineral soils continue to lose SOC. The estimated EU annual emissions from mineral soils under cropland are 27 mtCO_2eq (EC 2018a). 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 management practices, however, mean that the potential for sequestration can vary significantly at farm and plot level.

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

Box 33 Recommended scheme for maintaining and enhancing SOC in Mineral Soils – a summary

Objective: Incentivise increases in SOC stocks while ensuring that 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 scheme.

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

Overarching considerations: (1) the selection of monitoring, reporting and valuation (MRV) approach (measurement or estimate) and (2) the acceptable level of environmental uncertainty.

Scheme types and governance: Existing schemes can be grouped in four main types:

1. Scheme where farmers are offered a menu of measures from which to choose, but where payments are calculated based on the expected result of the measure rather than the income foregone or additional costs. At the same time, monitoring of SOC levels is done on a subsample of farms so that the overall project impact and measure impact can be estimated. This is a learning-by-doing approach, where experience is gathered on results aspects.

2. Hybrid scheme: where farmers are paid up-front with a guaranteed payment (thus acting similarly to an action-based payment), the monitoring is done at regular intervals, and the farmers receive a top-up at the end of the commitment period which rewards the difference between the upfront payment

and the total result.

3. Certified credits or pure result-based schemes: where farmers are paid solely for the measured or estimated result in changes in SOC levels on an ex-post basis.

4. Company efforts as part of reducing carbon footprint in supply chains

The governance and MRV requirements vary across these schemes.

Monitoring, reporting and valuation (MRV): Farm-level monitoring quantifies improvements in SOC levels (tCO_2eq) 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 emission component to it.

Typical project steps include:

Step 1: Baseline level of SOC on the farm is established via sampling and/or calculation that is sufficiently robust. There is strong preference for sampling and where calculation approaches are used, these should be robustly ground-truthed;

Step 2: Farm advisers/consultants assist farmers to identify management actions to maintain/enhance SOC levels and develop a SOC management strategy for the project period as a minimum;

Step 3: Farmers implement the actions and keep records;

Step 4: Farms are visited by farm advisers in selected intervals (a minimum one time during the project); a second sampling is conducted; an evaluation discussion takes place to adjust management if needed; a payment is issued depending on the sequestration that has occurred; or a second guarantee payment is issued;

Step 5: At the end of the project duration, a final measurement takes place;

Step 6: Farmer commits to maintaining the levels for a minimum of 5 years after receiving the last payment. To buffer against short commitment periods, discounting and buffers are applied. Schemes should strive to increase the commitment period to at least 10 – 15 years and include robust buffers.

Rewards: Farmers are rewarded at a set rate of € per tonne 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_2eq 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.

Learning from existing projects and methodologies: Scheme designers should draw on experience from ongoing initiatives and projects, in particular from French

CARBON AGRI's SOC methodology (expected in autumn 2020), Indigo AG Carbon Pilot (the draft methodology is open for consultation[37]), Gold Standard SOC Framework Methodology, Ebenrain Humusprojekt and Solothurn Project in Switzerland, LIFE Carbon Farming Project in Finland, CarboCert Germany, Kaindorf Humuszertifikate. Moreover, FAO has published a protocol for SOC monitoring, reporting and valuation (MRV) that should be considered[38].

Scope and knowledge basis: The scheme focuses in 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 SOC increase, for example degraded soils. Finally, they provide guidance for directing efforts in terms of the design of result-based scheme (for example, in setting payment levels or eligibility criteria). Where the potential for carbon sequestration is large (the change occurs faster and the total amount of carbon sequestered leads to higher reward), this leads to improved reward – transaction cost ratio and mechanism uptake.

Eligibility: The scheme 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. Moreover, it is recommended that the SOC increase is achieved without the application of additional organic fertilisers. While this reduces management options and the speed of SOC sequestration, it avoids carbon leakage effects.

Uncertainties and monitoring, reporting and valuation (MRV) costs: Two main approaches for setting the baseline and monitoring of SOC changes are available: a measurement approach via sampling and an estimation approach via combined sampling and modelling. In both cases, costs are currently high, posing barriers to the scheme's feasibility. However, several initiatives and technological developments are ongoing that are anticipated to reduce these costs over the coming years. In the meantime, the scheme 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 some of the 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 site-specific potential of agricultural measures to sequester SOC enables scheme designers to better set the reward values and understand the economic costs and benefits of a project in a given area. If this knowledge is not available from the outset, it can be generated during the project duration. Data generated by applying the scheme should be stored and used to evaluate and improve knowledge on SOC levels, and can be used to ground-truth and train models.

37 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)

38 http://www.fao.org/3/cb0509en/cb0509en.pdf

Farmer engagement: Actively engaging farmers in the scheme design process and regularly consulting them through the operation can increase farmer buy-in and uptake. 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 requirements, 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 scheme should integrate from outset training and advisory opportunities that facilitate farmer learning, including peer-to-peer learning.

Additionality: Schemes need to aim for environmental additionality (climate actions that would not have occurred in the absence of the scheme 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 reviewed projects mostly focus on the changes in SOC levels as the key result indicator. However, the scheme 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_2O emissions associated with soil management). Monitoring co-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 after which 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 to 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 payments) or targeted, i.e. a % set aside for farms with especially uncertain results in terms of SOC change. For example, 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, scheme designers should consider several options. These can also be seen as stepping-stones through which the scheme can move as additional knowledge / MRV capacity and experience are gathered: 1) Payments are calculated based on the expected results 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 changes in SOC levels on an ex-post basis.

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

Funding and governance: If schemes want to develop verified, fungible offset credits or verified emissions reduction certificates, schemes must meet the standards set by external verifying authorities and beyond (for example, Label Bas Carbon, Gold

Standard, Verra). Schemes can also seek external funding without having external verification. Schemes that do not seek external funding can be more flexible in their governance.

Overall conclusion on maintaining and enhancing SOC in mineral soils: 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 and risk of reversibility at farm / field level pose a barrier to result-based schemes. Ongoing technological developments, increasing knowledge base (on more granular potentials and impacts of agricultural practices) and learning-by-doing can support the transition from more activity-based to hybrid and fully result-based mechanisms. In the short term, action-based payments and hybrid mechanisms may be more attractive and feasible for upscaling.

8.4. Livestock Farm Carbon Audit

Context**:** the **European livestock** sector – such as beef, dairy, sheep and pork farms - is responsible for 81% of all Europe's agricultural emissions (Leip et al. 2015). Including its induced impacts on other sectors such as energy, industry, land-use change, and feed importation, the EU livestock sector has a global warming impact equivalent to almost 20% of EU total emissions (Leip et al. 2015). On-farm climate actions such as herd management and feeding, animal waste management, crop management, fertiliser/energy consumption, can reduce livestock GHG emissions cost-effectively. 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 emission reductions they achieve (i.e. there is a direct link between their reward and the actual impact they have on the climate). Result-based carbon farming mechanisms can be based on **whole farm carbon audit tools** - computer programmes that calculate a farm's GHG emissions (and other indicators such as for example nitrogen balance, economic profit), based on input data that summarise the farm's management elements (e.g. animal number and type, feed type, etc.); existing examples include CAP2'ER, Solagro, Cool Farm Tool.

Case study's aim and scope: This case study outlines **how a farm carbon audit tool can form the basis of a result-based mechanism to incentivise emission reductions on European livestock farms.** It focuses on GHG reductions below a baseline level of emissions; it does not reward carbon sequestration in e.g. soil carbon or agroforestry (covered in other case studies). This document discusses all elements that are necessary for implementation, including monitoring, reporting, and verification, mechanism scope and participant eligibility, baseline setting and additionality, reward calculation, monetisation of emission reductions (e.g. offset credits) and governance.

Box 34 Recommended livestock farm carbon audit mechanism – a summary

Objective: Incentivise real and additional voluntary GHG emission reductions on livestock farms.

Scale/coverage: livestock farms (any that can be robustly assessed by farm audit tools), i.e. dairy, sheep, beef, goat farms in diverse geographic contexts.

Climate actions: any actions to avoid emissions that can be robustly measured by audit tools. *Note: the mechanism does not include carbon sequestration or storage (due to uncertainty and permanence risk).*

Monitoring, reporting and valuation (MRV): the farm carbon audit tool quantifies whole-farm GHG emissions (tCO_2eq).

Typical project steps include:

Step 1: A trained farm consultant visit the farm, calculates a baseline emission level and identifies climate actions to avoid emissions.

Step 2: The farmer implements the actions and keeps records.

Step 3: After five years, a consultant visits the farm again to calculate emission reductions over the period.

Rewards: The farmer is rewarded at a set rate per tonne of emission reductions, as long as they meet eligibility criteria (including "doing no harm" to other environmental and socio-economic indicators). Farmers do not receive offset credits or certificates.

Funding and governance: The mechanism can be funded either by a public body, internally within a company, or by external sale of offset credits/certificates. This funding decision determines governance requirements.

Design principles: 1) *Minimise MRV costs* and (2) *shift costs away from farmers* (to maximise farmer uptake and decrease overall mechanism costs); (3) *learning-by-doing* (the proposed mechanism is a strawman that will need to be adapted to the local context, evaluated and improved based on experience).

Recommendations related to upfront decisions

Two key up-front decisions overwhelmingly shape the mechanism design: the selection of the farm audit tool, and the level of environmental uncertainty to accept.

1. Farm carbon audit tools estimate GHG emissions (i.e. the baseline) and emission reductions (i.e. results), with moderate levels of robustness for many EU farm types and on-farm climate mitigation actions. A number of farm carbon audit tools are already available, while some mechanisms have custom built their own audit tools. Audit tools are increasingly being designed in such a way that they can be parameterised or adapted to different local contexts or different types of farms. Tool accuracy increases with relevant scientific data (i.e. it is higher for estimating methane emissions for livestock in French farms than for estimating soil carbon storage in Romanian farms). Emission reductions can be more reliably estimated than carbon storage or sequestration, as soil carbon estimates depend on geographic and temporal features that can be difficult or costly to capture in farm carbon audit tools. This mechanism also excludes soil carbon to avoid permanence issues. To ensure robustness, audit tools must apply scientifically recognised approaches (e.g. at least IPCC Tier 2 methods). While interviewees considered carbon audit 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 emission 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 the net benefit of the mechanism and reduce farmer uptake.

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

- **Funding approach**: i.e. will the emission reductions be sold as offset credits or financed by external parties? If they are sold as credits, this can demand stringent environmental certainty/tool robustness and hence 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 emission reductions, or also at other negative externalities (e.g. nitrogen runoff), or co-benefits (e.g. biodiversity outcomes or farmer income)? Does it consider long-run land-use efficiency or other systemic issues?

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 decisions 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 reducing MRV requirements, 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: Emission reductions are additional if the mechanism induces actions 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 (or the tool) 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, thereby educating and training the farmer.

While farmer rewards could be based on intensity gains, farmers should only be rewarded if they deliver absolute emission reductions, to guarantee real climate impact at the farm level. Other secondary objectives (i.e. co-benefits and addressing negative externalities) can be monitored by farm audit tools but should not be the primary focus of the mechanism. 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 option results in less uncertainty and transaction costs for the farmer, compared to being rewarded tradeable credits, and hence it will increase uptake. To boost farmer uptake, it would be advisable to reward 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 (not on on-site testing), with random audits and high penalties for cheating or other non-compliance. To reduce MRV costs, data inputs should be aligned with CAP reporting and existing data, as far as possible. The EU Farm Sustainability Tool, which is under development, could be a source of data or 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 requires stringent MRV, external verification, and/or a solid reputation. The resulting transaction costs may be too expensive and therefore 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, and MoorFutures). It is through the process of implementing their mechanism that barriers and solutions were identified, and trade-offs, costs and benefits became measurable. For this reason, mechanisms must have evaluation processes, including a stakeholder review and monitoring of impact on GHG emissions and other secondary objectives. High transparency is essential to ensure credibility and buy-in.

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 need to be supported by knowledge sharing and networking**. This includes exchanges between existing mechanisms and mechanism under development, and ongoing scientific development/validation of farm carbon audit tools. The Biodiversity 2030 and Farm to Fork Strategies, as well as eco-schemes in the new CAP, offer opportunities to develop local mechanisms.

Overall conclusion on livestock farm carbon audits: There are sufficient knowledge, experience and technical capacity to develop result-based carbon farming mechanisms to incentivise emission reductions on European livestock farms using whole-farm carbon audit tools. However, due to the importance of the local context (including objectives, farmer/consultant knowledge and interest, as well as geography), there is no one-size-fits-all approach. Accordingly, mechanisms must adapt to the local circumstances, ensure ongoing evaluation and engage stakeholders on mechanism development and implementation.

8.5. Managing Soil Organic Carbon on Grasslands

The aim of this case study is to provide analytical insights, lessons learned and guidance on how to design and operate a result-based carbon farming mechanism on grasslands in an EU carbon farming context. There are only a few (current or past) result-based initiatives rewarding carbon sequestration on grasslands in Europe to learn from, so the study mainly builds on learning from result-based rewarding systems for biodiversity enhancement, such as the Burren Programme in Ireland and the Result-Based Agri-environmental Payment Schemes (RBAPS) in Ireland, the UK and Spain. The Sown Biodiverse Pastures Project on grasslands, financed by the Portuguese Carbon Fund, provides insights on setting up and managing carbon sequestration initiatives on grasslands with result-based reward mechanisms using indirect measurements.

We only consider four overall categories of land use and management changes that contribute to carbon sequestration on grasslands: 1) the ongoing management of existing grasslands; 2) conversion of 'fallow/set-aside' areas to grasslands; 3) the replacement of annual cropland with grassland, including arable land that is economically marginal, such as sloping land or shallow soils, which are especially suitable for grassland management; and 4) avoided emissions from averted conversion of grasslands to arable land on soils that are suitable for cultivation.

Changes in carbon on managed grasslands can happen in two main pools: soils and biomass. Since we are looking for permanence, the grasslands case study looks at the changes in soil organic carbon (SOC), and not at the changes in biomass, since the latter is subject to high fluctuations.

Some of the key challenges of designing an effective grasslands carbon sequestration reward system include costs and uncertainty of measuring changes in SOC and hence carbon sequestration in soils. Related to this, another challenge relates to establishing cost-effective MRV across different geographies/contexts where spatial variations in the content of SOC are significant. Ensuring permanence is also challenging, because of the reversibility of soil carbon gains plus the long timescales before significant carbon changes can be reliably detected.

The feasibility of the mechanism relies on a range of factors, some of them depending on the socio-economic context in which the initiative takes place. The overall feasibility considerations seem to focus around the following set of factors: i) 'relatability' for the involved farmers; ii) opportunity costs and risks related to the likelihood of the initiative resulting in a payment; iii) simplicity and administrative burdens put on the farmer in order to participate in the mechanism and comply with the rules of the initiative; iv) transaction costs – and related economic and/or practical/knowledge barriers for uptake; v) coherence and compatibility with other (parallel) initiatives (and/or policies and regulations); vi) uncertainties – with regards to actual potential for carbon sequestration on the farms, and with regards to measurements and robustness of MRV; and vii) fair baseline and target setting.

The likelihood of success of an initiative depends to a large extent on management practices and agro-climatic conditions: success rates will be higher where the potential for SOC sequestration is large (e.g. degraded, overgrazed grasslands, where the change occurs faster and the total amount of C sequestered leads to higher rewards). Besides, on such lands the reward – transaction cost ratio is more favourable and uptake and permanence more likely.

The level of required certainty on the achieved climate results depends on the objectives of the initiative. If mechanisms want to develop verified, fungible offset credits or verified emissions reduction certificates, mechanisms must meet the standards set by external verifying authorities, like Gold Standard and Label Bas-Carbone. Mechanisms that do not seek external funding can be more flexible in their governance structures.

Farmer engagement is crucial for uptake and long-term sustainability/ permanence of any initiative on farmland. Removal of barriers to uptake, and optimization of drivers and engagement factors are therefore important for long-term sustainability and permanence of impact.

Barriers to farmer uptake arise from mainly two areas: 1) (perceived and real) financial concerns and 2) uncertainty and complexity of the initiative and the impact it may have on the overall farm practices.

Multi-stakeholder engagement is a key enabler in establishing effective mechanisms. Active involvement of farmers is important as well as the dialogue between them, as the practitioners, owners and managers of the land, and the researchers and advisers. This has been key to establishing and operating innovative (grazing or other) result-based biodiversity enhancement strategies on grasslands, and experienced practitioners within these initiatives claim that this would be crucial to any grasslands initiative for result-based carbon sequestration.

Deciding on the result indicators that will be linked to payments in a way that is transparent, relevant and relatable for the farmer is key to acceptance and uptake. Also, the multifunctionality of grasslands in providing multiple ecosystem services besides climate regulation and adaptation, should be recognized and rewarded. Hence, co-benefits like enhanced biodiversity, improved soil water holding capacity and stability, etc. should be considered when deciding on indicators for the initiative. The use of direct and indirect/proxy indicators are not mutually exclusive; existing experiences focussing on managing SOC on grasslands show that the best option is to use both kinds of indicators.

The feasibility, reliability and costs of MRV is by far the most important challenge in relation to result-based initiatives for grasslands. The part of the costs borne by the farmers is of particular importance since it can turn out to be an unsurmountable barrier to uptake, if the administrative and financial costs are too high, and exceed the advantages and net benefits of being part of the initiative.

A hybrid mechanism rewarding both actions taken and results achieved – with regard to co-benefits and SOC sequestered – seems at present more enticing to farmers than a result-based mechanism where famers are only paid ex-post for actual tons of carbon sequestered.

Box 35 Recommended scheme for managing SOC on grasslands – a summary

Objective: incentivise avoided emissions, maintenance and enhancement of SOC on grasslands.

Scale/coverage: there are four main categories of land use/management to consider for result-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 emissions because of the avoided conversion of grasslands to arable land, even though the land is suitable for arable crops.

Climate actions: all actions that maintain and/or increase the SOC content in grasslands and do not have adverse impacts on other ecosystem services, biodiversity and socio-economic factors.

Design principles:

- Action-oriented, farmer-centred design that is based on the local agro-ecological context– actively engaging farmers in the actual design of the initiative(s);
- Local anchorage with a trusted advisory service as the initiative manager;
- Minimizing MRV costs;
- Simplify administrative procedures and shift costs away from farmers (to minimize transaction costs and maximize farmer uptake and permanence and);
- Learning-by-doing – any mechanism set-up needs to be evaluated and improved based on experience.

MRV: the selection of MRV approaches – 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 advisers in dialogue with farmers establish a baseline level of SOC, agree on relevant indicators (proxy and/or actual changes in SOC) and agree 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 are 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 result-based payment is recommended – so that investments, efforts and management changes towards increased carbon sequestration are and rewarded, while actual carbon sequestration is also 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 financed with 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 conclusions on managing SOC on grasslands:

Despite the challenges, the size of land under grasslands in Europe and the overall potential to deliver significant and efficient climate impact, makes carbon farming in grassland an interesting option to explore. The following elements are key enablers of successful result-based initiatives on grasslands:

- A farmer-centred approach, building on effective, practical and relatable solutions that fit into what the farmers are already doing, decreases the barriers for uptake and enhances the likelihood of permanence. It furthermore facilitates learning, revisions and adjustments towards a more effective mechanism developed over time.
- Recognising investment and efforts made to increase carbon sequestration — as opposed to rewarding only the carbon sequestered at the end of the initiative — increases farmer engagement.
- Recognising co-benefits like biodiversity enhancement, water retention capability and reduced soil erosion - and using these as proxy-indicators for carbon sequestration, enhances farmers ability to see where they can improve their management practices to increase carbon sequestration.
- Designing an initiative that optimizes the economic benefits for the farmer beyond the carbon sequestered and that limits (real or perceived) additional costs associated with participation in the initiative, will also increase uptake.
- A transparent and relevant payment mechanism builds trust and engagement.
- A cost-effective, understandable and non-burdensome MRV mechanism removes (at least some) of the transition costs and administrative burdens for the farmer, hence, facilitating uptake and permanence.
- Providing trusted advisory services to the farmers during design and implementation of the initiative builds trust and enhances the likelihood of farmers applying the most optimal management procedures.
- Working with farmers to raise awareness of the benefits of SOC sequestration for the farming business and as a societal climate action to mitigate climate change enhances farmers' interest and pride in being an active partner in the common fight against climate change.

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