Carbon Farming:

Stakes, issues and alternatives

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Background

In December 2021, the European Commission adopted its Communication on Sustainable Carbon Cycles, as foreseen in the Farm to Fork Strategy. The main objective of the Communication was to propose the development of tools to achieve carbon neutrality in Europe. Carbon neutrality implies a balance between greenhouse gas (GHG) emissions and their removal from the atmosphere by increasing carbon sink capacities. To this end, the Communication focuses on two main tools: industrial carbon capture and recycling, and carbon farming.

To reach the climate neutrality objective of the EU Climate Law, carbon farming has to contribute to increasing the land sector carbon sink capacity by 42 million tonnes of CO2 equivalent (42 Mt CO2eq). This contribution is needed to reach the EU's overall target for the land sector of 310 Mt CO2eq by 2030.

In the Communication, carbon farming is presented as a green business model that rewards farmers for implementing agricultural practices that increase carbon stocks in the living biomass and soil and/or reduce the release of carbon into the atmosphere. Carbon farming practices are already being implemented in Europe, through the Common Agricultural Policy (CAP), or in the form of private initiatives that support farmers in implementing practices and sell carbon credits on voluntary carbon markets for reward. The great plurality of carbon farming implementations, whether in terms of technical standards, calculation methods or economic models, creates urgency around the regulation of its development.

In order to regulate this growing market and to ensure the coherent development of carbon farming, the Commission first published a technical handbook on carbon farming and then, in November 2022, presented a proposal for a regulation establishing a certification framework for carbon removal.

The hopes that the Commission puts into the development of carbon farming as a new business model have created a dense debate on the European scene. On the one hand, the potential risks of scaling up carbon farming initiatives through private funding has brought backlash, with many NGOs highlighting the risks for farmers, access to land and climate change mitigation. On the other hand, however, the rapid growth of voluntary carbon markets, the increasing demand from the private sector for carbon credits, and the fact that carbon farming and voluntary markets are already being developed without concrete framing indicates that rejecting any carbon farming regulation other than a prohibition would not be a safe strategy.

In that context, this study aims to contribute by presenting a critical analysis of the legislation, pointing out the shortcomings and associated risks. We will then explore alternatives to the proposed regulation, including propositions for regional and local governance of carbon farming as well as an alternative business model to scale-up regenerative agriculture in a way that boosts the agroecological transition while limiting the potential risks of a carbon farming strategy.

1. Introduction

The study's building blocks

To help ensure that our conclusions can be understood by a wide audience regardless of the reader's prior level of knowledge, this study has been divided in two main sections. In the first section, we introduce the basic definitions, issues and stakes of carbon farming. Each chapter concludes by identifying a series of key questions that would need to be answered before a coherent carbon farming regulation can be developed. In the second section, we confront these questions to the proposed regulation and explore how alternative implementations of carbon farming can allow us to draw key lessons that help answer the questions raised. We then assess the complementarity of carbon farming with the CAP.

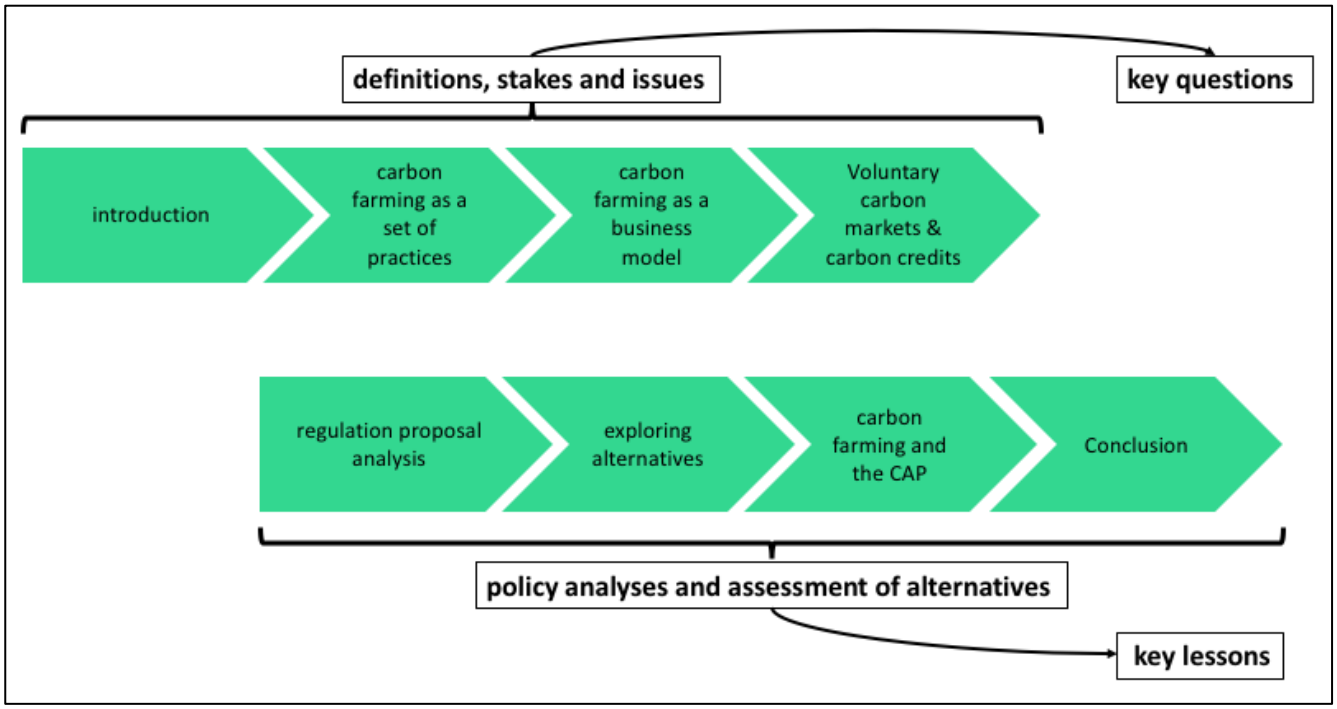

Figure 1: the study's building blocks

What is carbon farming?

First and foremost, carbon farming consists in a set of land management practices. In more specific terms, it is often defined as a set of agroecological and soil conservation practices aimed at absorbing carbon and reducing its emission, that also provide environmental benefits by restoring biodiversity, protecting water and soil quality. Carbon farming is thus seen primarily as a climate mitigation tool for the agricultural sector, but one that offers agroecological co-benefits as well (McDonald et al. 2021). Defined as such, carbon farming sets a hierarchy in its objectives with climate mitigation at the top.

In their essence, all the practices that fall under the umbrella of carbon farming are just part of what can be largely defined as agroecology. In a more holistic approach to agrarian transition, each farm should be able to implement a specific set of agroecological practices that corresponds to the farm's needs.

But due to the technical challenge of developing holistic actions and to the will to find opportunities for private funding, carbon farming is being developed mainly as an isolated model. Therefore, for the purpose of this study, we will evaluate carbon farming in its own right – including its potential benefits and risks - as a tool aimed at reaching the goal of a net zero Europe.

The potential of carbon farming for climate change mitigation

In terms of carbon sequestration in soils, literature reviews indicate that the mitigation capacity of carbon farming could range from 101 to 444 MtCO2eq/year (McDonald et al. 2021). Looking at the potential for carbon sequestration in soils in an agroecological Europe, the Institute for Sustainable Development and International Relations (IDDRI) reaches a similar conclusion with a capacity of 159 MtCO2eq/year (Aubert, Schwoob, and Poux 2019). This represents approximatively 4% of the total EU emissions or 25% of the EU agricultural sector emissions (without adjusting for imported/exported emissions) (EEB 2018; McDonald et al. 2021).

According to the Intergovernmental Panel on Climate Change (IPCC), the main reason to prioritise sustainable land management is to prevent and reduce land and soil degradation and therefore help ensure food security. Indeed, it is important to note that soil erosion is about two times higher than soil formation in agricultural lands of the EU (Montanarella and Panagos 2021). Land-based options to deliver carbon sequestration in soil or vegetation can also contribute to climate change mitigation but the IPCC insists that accumulated carbon in vegetation and soils is at risk from future loss triggered by disturbances such as flooding, drought, fire, pest outbreaks, or future poor management. Overall, on carbon removals, the IPCC recommendation is that it should be used as a last resort tool to compensate residual emissions (IPCC 2019).

Moreover, it is important to note that carbon sequestration through land management is limited in the long term for four main reasons:

1. The capacities and rates of storage decrease over time (FAO 2020; Aubert, Schwoob, and Poux 2019).
2. The carbon stocks created are reversible (FAO 2020; IPCC 2019; Aubert, Schwoob, and Poux 2019).
3. On the long term, mitigation effect of the carbon stored could be partly offset when considering non-CO2 emissions linked to certain carbon farming practices. N2O emissions in particular seem to be interlinked with carbon storage but the complexity of its mechanism is not yet fully understood by the scientific community and more research should be done on the topic (FAO 2020; Aubert, Schwoob, and Poux 2019; Guenet et al. 2021; Haas et al. 2022; Lugato, Leip, and Jones 2018).
4. Different climate change trajectories result in variable carbon storage capacities, ranging from a net storage potential to a net emission potential (Jancovici 2007).

To illustrate the last point, you find below a simulation made by the Hadley Centre on the evolution of carbon stocks in soil and vegetation in a business as usual climate change scenario. It shows that if the reduction of emissions is not the highest priority, removals would all end up being released until the ecosystems shift from sink to emission source.

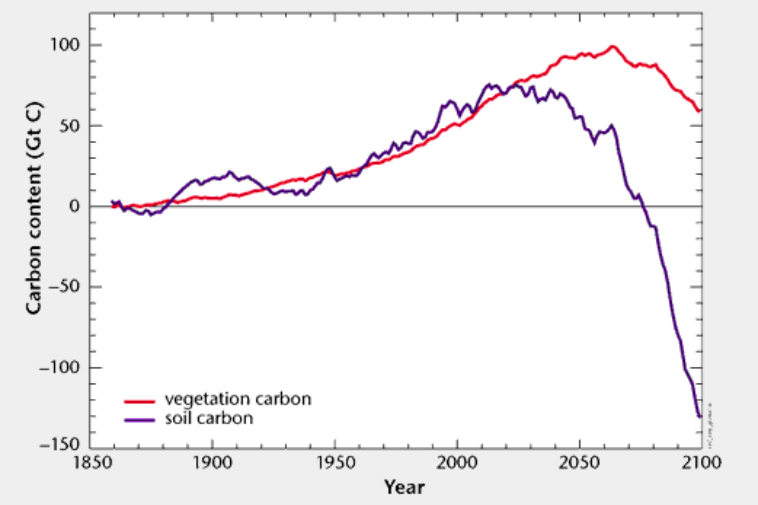

Figure 2: evolution of carbon stocks in a business as usual climate change scenario (Jancovici 2007)

To conclude, it is clear that the potential of the agricultural sector to stock carbon is significant and should be considered. But the uncertainty of its permanence and capacity over time would lead us to consider it only as a last resort tool for compensating residual emissions, as recommended by the IPCC.

The risk of net zero politics

European climate objectives are expressed in net emissions. This means that an insufficient drop in GHG emissions could be balanced by an equivalent offset. Offsetting should be the last resort tool, following avoidances and reductions. But what can be observed now is the development of offsetting schemes much before any concrete reduction plan has been proven reliable. And this trend is growing fast, as one in five of the 2000 largest publicly listed companies have now committed to a net-zero emissions pledge (Reuters 2021). There is thus a concrete risk that the possibility for large emitters to offset their emissions has a counter-productive effect, by postponing reduction efforts. Before any offsetting scheme is deemed useful, any participant should be able to prove that they implemented an emissions reduction plan. The plan should indicate reduction targets and those targets must have been met for a determined amount of time prior to having access to offsetting schemes.

Key questions to keep in mind - Chapter 1: introduction

1. How can we prevent that an offsetting scheme is not cancelled out by future climate change scenarios, natural events, change in practices or a wrong evaluation of the results?
2. How can we ensure that an offsetting scheme is only used as a last resort mechanism, after avoidance and reduction of emissions?

2. Carbon farming as a set of practices

Carbon farming practices are often divided into five categories of interventions:

1. Peatland rewetting and restoration
2. Agroforestry
3. Maintenance and enhancement of soil organic carbon in mineral soils
4. Grassland management
5. Livestock and manure management

Those five categories have different mitigation potentials and co-benefits for farmers and the environment. They differ in their mitigation mechanisms as well (McDonald et al. 2021; European Commission. Directorate General for Climate Action. et al. 2022). There are three types of mitigation mechanisms: emissions removals, emissions reductions and avoided emissions. Removals refer to the sequestration of carbon in soil and biomass. The capacity to sequester carbon at farm level highly depends on geological and climate conditions as well as soil type and heterogeneity (Aubert, Schwoob, and Poux 2019). Emissions reductions include reductions below the current level of farm emissions or below a determined baseline. Avoided emissions refer to the maintenance of already stored carbon or to the prevention of added emissions on farm (Scherger 2022).

Table 1: mitigation potential and mechanism of carbon farming practices (Own elaboration, based on McDonald et al. 2021)

	Peatland rewetting and restoration	Agroforestry	Maintenance, enhancement of soil organic carbon in mineral soils	Grassland management	Livestock and manure management
EU mitigation potential (Mt CO2eq/year)	51-54	8-235	9-70	14-66	19
Mitigation mechanism	avoided emissions; slow removal	removal	removal; avoided emissions	reduced emissions	reduced emissions

If removals can be assessed by direct measurement of carbon stored compared to the initial situation, reductions and avoided emissions can only be assessed by analysing the result of a practice with reference to a hypothetical scenario, or baseline. The mitigation results will thus highly depend on the scenario chosen as a base for comparison.

As explained in the previous chapter, the mitigation potential could vary greatly when considering future climate change scenarios, reversibility of the stocks, or by adjustment due to a better understanding of soil carbon sequestration mechanisms.

Key questions to keep in mind - Chapter 2: Carbon farming as a set of practices

1. Should carbon farming schemes include all mitigation mechanisms (removals, avoided emissions and reduced emissions)?
2. Should all mitigation mechanisms be certified together or separately?

3. Carbon farming as a business model

Even though arguments other than remuneration can convince some farmers to implement new practices or change the land use on their farm (e.g. gain in resilience, decrease in input costs, willingness to lower their impact on nature), most of the time, it is necessary to compensate the farmer with an increased source of revenue. Indeed, there are risks and often investments needed when transitioning to a new farming system.

Two types of business model

There are various business models that can be put in place to ensure increased revenue. Each business model has its own strengths and weaknesses. In this chapter, we focus on two – farm practice payment model and voluntary carbon market with intermediaries model - because they can be related either to the CAP business model (rural development measures of Pillar 2 or the new eco-schemes) or to the regulation for carbon removal certification proposed by the Commission. These models can use three types of approaches to assess the success of a carbon farming program.

1. Action-based approach: The implementation of an action throughout the monitoring period will be the main requirement to receive a financial compensation.
2. Result-based approach: It requires that the mitigation outcome can be quantified. The farmer will be paid in accordance with the result.
3. Hybrid approach: The farmer will receive a first payment to start the implementation of a practice and additional payment will then be paid according to the result.

Depending on the business model that is chosen, some approaches will be preferred. And each approach will entail different levels of risk for the farmer, entry cost for farmers and administrators, types of funding (public or private), monitoring (MRV) costs and complexity, uncertainty about the result and uncertainty of revenues for farmers (McDonald et al. 2021).

Table 2: synthesis of two carbon farming business models (Own elaboration, based on McDonald et al. 2021)

	farm practice payment	voluntary carbon market with intermediaries
approach	Action based	Result based / Hybrid
source of financing	Public or NGO	Private – market
Monitoring (MRV) complexity and costs	Low-Medium	Medium-High
entry costs for farmers	Low-Medium	Medium-High
certainty of the revenue for farmers	High	Medium-Low
certainty of the mitigation result	Low	Medium-High

This table is a concise representation of how carbon farming is most often implemented. In the next section, each characteristic will be discussed in more detail.

Challenges for designing a carbon farming business model

MRV

MRV stands for monitoring, reporting and verification. Monitoring refers to the measurement of the increase in carbon stocked or decrease in carbon emissions, reporting to the communication of the results, and verification to the ability of the administration or an external audit agency to verify the results.

Monitoring can be achieved by following up on a practice implementation, direct measurement, modelling, or a mix of these methods. Direct measurements provide the highest accuracy but can be prohibitively expensive. Modelling provides estimations based on direct measurements of proxies (e.g. tree width) and scientifically proven relationships. With modelling, the certainty of the results highly depends on the state of scientific research, but it entails lower MRV costs.

Quality reporting and verification entails the implementation of secure registries, long-term reporting obligations and random and targeted auditing.

MRV costs are higher in a voluntary carbon market model because private investors will want to have a high certainty that the credit they bought ensures that a tonne of carbon has been stored or avoided.

Entry costs

Entry costs represent all the costs that a farmer or an administration would have to provide to access a program (in the case of a farmer) or develop a program (in the case of an administration). They include learning and training, mechanism design, funding research, data collection, implementation costs (e.g. purchase of equipment), baseline setting costs. It is important to note that MRV and entry costs can be borne by farmers, a public administration (e.g. through CAP funds), or by the carbon credit buyer.

Inclusivity for all farmers

In these business models, only farmers who have a large margin of action on their farms might have an opportunity to participate. That means that farmers who have already fully or partially transitioned in the past (e.g. to organic farming or regenerative agriculture) might not have the opportunity of taking part in a carbon farming scheme. There is a risk that carbon farming would mostly reward farmers that have been the most destructive in the past.

Permanence

The issue of permanence refers to the capacity to stock carbon in soils and vegetation in the long term. CO2 has a very long retention time in the atmosphere. On average, it is evaluated that half of the CO2 surplus emitted by human activities would have transferred to another natural reservoir, mostly the ocean, in 100 years. After 1000 years, about 20% of the CO2 surplus emitted will still be left in the atmosphere. The rest can take up to 10 000 years to be transferred to other reservoirs. Moreover, in the case of a business as usual climate change trajectory, the capacity of oceans to absorb the carbon from the atmosphere might decrease because of slower oceanic currents, maintaining larger amounts of CO2 in the atmosphere (Jancovici 2007; 2008; 2001).

Therefore, creating a system where carbon can be sequestered for a few years, even a few decades, will have almost no mitigation impact. The sequestration of carbon must be permanent. The exact timing is debatable but at least 100 years is the most common reference.

In the specific case of carbon farming, ensuring that the carbon stored is stable can be difficult. Carbon stocks can be intentionally or unintentionally released. It would be considered an intentional release if farmers decide to change the practices that stored the carbon in the first place or if the next generation of farmers decides to do so. Unintentional releases include fires, droughts, floods or other natural disruptions.

Additionality

The principle of additionality refers to the necessity that a practice leading to a carbon removal or emission reduction would not have happened without the incentive of the remuneration. This means that the practices must go beyond what is required of farmers by law.

Especially in Europe, because of the CAP, additionality will be complicated to assess. Below is one hypothetical example of such a situation.

The CAP is renegotiated every 7 years. GAECs, or "good agricultural and environmental conditions", are the mandatory rules in the current CAP that farmers must comply with in order to receive direct payments. By definition, a carbon farming practice must go beyond the GAEC requirements to be additional. In a scenario where there is a monitoring period of 10 years, if a farmer starts a carbon farming practice in 2025 that at that time goes beyond GAEC requirements, the mitigation impact would be deemed additional. But if the new 2027 CAP increases GAEC requirements beyond the practices implemented by that same farmer, would the mitigation impact still be considered additional until 2035?

Carbon leaking

Carbon leaking happens when a reduction of emission on one farm is transferred elsewhere, to another farm. Carbon leaking can be local but can also happen on the world scale.

Here are two examples to illustrate carbon leaking.

1. *A farmer could move a production that is not compatible with carbon farming practices to another plot of fallow land or grassland.*
2. *A farmer could stop using fertilizers on a grassland plot but compensate the productivity loss by importing feed from Brazil.*

To avoid carbon leaking, it is essential that carbon farming implementation is based on whole farm scenarios and that direct and indirect emissions are considered with a large scope.

Co-benefits and risks

Although a lot of carbon practices provide environmental co-benefits, the opposite can also be true. Some practices such as the use of biochar or municipal compost for enhancing soil organic carbon could have negative effects on soil biodiversity. Similarly, implementing agroforestry measures that are not locally adapted can have negative biodiversity and adaptation impacts. This is especially important to assess in a climate that will strongly change in the next decades.

Baseline set-up and methodology

As explained in the previous chapter, some mitigation mechanisms (avoidances, reductions) can only be assessed by comparison to a baseline scenario. The methodology that is used to define the baseline will affect the results. But using a baseline for comparison also offers some opportunities. Comparing all mitigation mechanisms of a farm to a well calibrated baseline can be an inclusive methodology. Farmers that have made efforts in the past could still be compared to the baseline and be rewarded accordingly.

Various methodologies for calculating the climate change mitigation impact are being developed, some with questionable results. For example, CarbonAgri in France are using a methodology based on the carbon intensity metric. The carbon intensity metric evaluates how much GHG are emitted to produce a product. A lower carbon intensity indicates a decrease in the amount of GHG emitted per product but an increase in production volumes can cancel out the benefits (rebound effect). Although there will always be a degree of uncertainty linked to those methodologies, it is essential that more research is being financed to build robust models.

Land grabbing

With the demand and price of carbon credits increasing, there is a strong risk that there will be a land rush from investors. This is already observed with the CAP and its direct payments by the hectare. The CAP has been a key cause for the increase in farm size and disappearance of small and medium family farms in Europe. Carbon farming could have the same effect if investors would buy land to implement carbon farming practices and benefit from carbon credit revenues, driving the prices for agricultural land up in the process.

Australia, where a carbon farming program was launched in 2011, has already lived that scenario. After the first ten years of the program, the government had to put forward legislation to veto carbon farming projects above 15ha to stop investors from speculating on land (Grain 2022).

Key questions to keep in mind - Chapter 3: Carbon farming as a business model

1. How can we design a carbon farming scheme that combines high inclusivity for all farmers with low levels of uncertainty? How can we balance entry and MRV costs with the certainty of results?
2. How can we ensure that farmers who have already taken steps towards resilience can also be rewarded?
3. How can we ensure the permanence of the results? Or how can we design a carbon farming scheme where uncertainty about permanence has less impact on climate change mitigation?
4. How can we ensure the additionality of the results, especially when considering the CAP?
5. How can we ensure that there is no carbon leakage in a carbon farming scheme?
6. Should the mitigation results be assessed against a baseline scenario? What methodology should be used to define a baseline?
7. How can we ensure that carbon farming doesn't impact land prices and accessibility for farmers?

4. Voluntary carbon markets and carbon credits

Carbon credits

A carbon credit is a financial tradable asset that represents the removal or non-emission of 1 tonne of CO2eq. Carbon credits can be registered once into an organisation's or a country's emission registry and be accounted as a carbon offset. In other words, the purchase of a carbon credit is similar to buying the right to emit 1 tonne of CO2eq without it impacting the emitter's emission total. Carbon credits can be bought by speculative investors (who will hope that the price will have gone up when they sell them) and end buyers. Once an end buyer registers the credit as a carbon offset, the certificate is removed from the market and labelled as retired (IETA 2021).

A strong demand growth in carbon credits is anticipated in the future (times 5-10 over the next ten years; times 8-20 by 2040; and times 10-30 by 2050). While in previous years the surplus of carbon credits on the market ensured a low selling price, the rapid increase in demand is leading to an overall price increase. The price of a carbon credit is strongly linked to the sustainable development co-benefits of the project, such as biodiversity protection, improved public health and new employment opportunities (South Pole 2022).

Carbon markets

Carbon credits can be bought in order to comply with legislation, or it can be a voluntary decision to tackle or compensate emissions. In the first case, the market would be called a compliance market while in the second case, it would be called a voluntary carbon market (VCM).

In the EU, the Emissions Trading System (ETS), based on the cap and trade methodology, is the regulated compliance market. It concerns over 10 000 installations in the power sector and manufacturing industry. Every year, a number of emission quotas are distributed or sold (depending on the industry type). They can then be traded when unused. In addition, industries registered in the ETS can buy carbon credits from regulated offset schemes, notably through the Clean Development Mechanism. This study does not elaborate on the failure of the ETS, where too many quotas were introduced, causing the carbon price to never reach a sufficient level to divert industries from a compensation logic (Tanuro 2012; gov.uk 2016; climat.be 2019). However, we will note that industries regulated by the ETS, notably fossil fuel companies, have shown interest in being able to purchase carbon credits on voluntary carbon markets as well (Scherger 2022).

Voluntary Carbon Markets (VCMs) are markets that enable private investors, companies, governments and other types of organisation to purchase carbon credits. Carbon credits sold on VCMs to private companies concern firms that have no obligations or legally binding targets in terms of emissions reductions. In the past few years, many large companies but also small businesses have made pledges to reach net zero emissions in the future. As some of these companies have either no intention to strongly reduce their emissions in the short term, or have no possibilities of bringing them to zero, they are betting on offsetting capacities. These voluntary pledges increase the demand for carbon credits

and VCMs have seen a strong growth in the past years Carbon credits sold on VCMs are certified by specialised certification agencies. The two best known are Verra and the Gold Standard. (Veillard 2022; Tordjman 2022; Climate Change Committee 2022; Scherger 2022; IETA 2021)

If part of farmers' revenues might depend on carbon markets in the future, it is important to assess the needs for their stability. Regardless of the usefulness of carbon offsetting as an income tool for farmers, to be discussed separately, the credibility of this system depends on at least three conditions.

The first condition is a stable and high carbon price. On a VCM, prices are highly variable because they are based on supply and demand and because most of the supply is not homogeneous. Nature based carbon credits are not homogeneous by definition. They vary in type (removal, reduction or avoidance), localisation, scarcity, permanence and additionality requirements, and by the co-benefits they generate. Finding solutions to ensure high and stable prices could be challenging (South Pole 2022). More importantly, a higher carbon price could be a good incentive for companies to prioritise reductions compared to offsets. Other price characteristics should also be debated, such as the need for a world carbon price and the possibility of minimum prices (IETA 2021).

An offsetting system also needs to ensure total equivalence between the carbon that is effectively removed or not emitted and the quantitative value of the carbon credit. This means that an efficient compensation carbon market would require significant MRV costs (IETA 2021).

Transparency of VCMs is an essential condition to win the confidence of all actors and ensure financial stability. Most notably, the additionality and permanence of offsets must be transparently assessed and catalogued. The system must also ensure that there is no double counting of offsets. Furthermore, good transparency is needed so that carbon farming projects consider social and resilience aspects as well as all the co-benefits(IETA 2021).

Key questions to keep in mind - Chapter 4: Voluntary carbon markets and carbon credits

1. Should carbon credits produced through carbon farming be purchasable by speculative investors or end buyers only?
2. Should industries registered in the compliance market (ETS) be able to buy carbon credits from the VCM?
3. How can we differentiate carbon credit buyers that are offsetting to avoid emissions reductions from those who are offsetting as a last resort method for hard to abate emissions?
4. Should carbon credits offer compensation rights in all cases?
5. What mechanism could ensure that there is no double-counting of the offsets on a national and international level?
6. Should we create specific VCMs for carbon farming to ensure their efficiency? What should be the size of those VCMs and what buyers should access them?
7. How can we ensure VCM transparency?

5. The commission's proposal for a regulation

From the previous sections, we can understand that carbon farming already exists and is being developed rapidly in Europe. We can also understand that carbon farming as a business model carries a lot of risks, from the uncertainty of the results, their additionality and permanence, to the potential counter-productive effects of net-zero strategies.

All those risks led us to ask questions about the operability of carbon farming in Europe. All the key questions from the previous section should be answered by the Commission's proposal for a Regulation on an EU certification for carbon removals. Next, we will decorticate what can be found in the proposal and see what questions have been answered.

What is in the proposal?

The proposal consists mostly as a vague rulebook for designing carbon removal certification schemes that the Commission will then be able to approve for implementation. The scope of the regulation goes beyond carbon farming and proposes a framework to certify industrial carbon removals as well.

The text integrates some requirements for ensuring the climate change mitigation potential of carbon removal activities.

- It sets out basic information on QU.A.L.ITY criteria for carbon removal activities: Quantification; Additionality; Long-term storage (Permanence); Sustainability.
- It states the obligation for publicly accessible carbon removal registries that are comparable.
- It states the obligation for a public release of annual reports from every certification scheme (that can be censored under certain conditions).
- It sets basic rules for the definition of baselines and methodology requirements for assessing the results of carbon removal activities.

The proposal is mostly a guide on the governance for certifying carbon removals. The figure below summarises the proposed framework for certification. A certification scheme can be developed by a public or private organisation. It must then be appraised by the Commission using the QU.A.L.ITY criteria. When approved, operators or group of operators can start registering in the certification scheme and implement carbon removal activities. To produce a certificate, an independent certification body must audit the activities and results. If the conformity of the activities is verified, a number of carbon certificates can be produced and sold on voluntary carbon markets for remuneration.

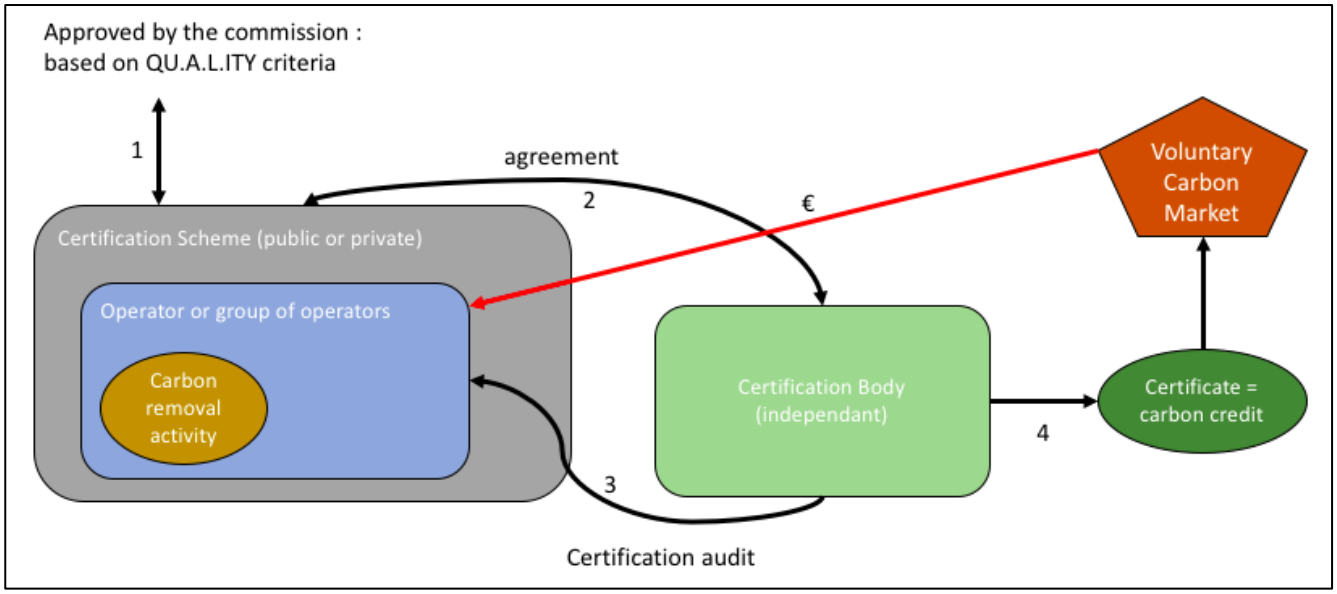

Figure 3: synthesis of the proposal for a certification framework on carbon removals (author's own elaboration based on the regulation proposal)

The proposal does introduce some concepts but lacks clear definitions and a clear strategy. Below, we will go over the main shortcomings of the proposal.

Shortcomings of the proposal: How does this regulation answer our key questions?

Regulation VS key questions from chapter 1: introduction

Key questions to keep in mind - Chapter 1: introduction

1. How can we prevent that an offsetting scheme is not cancelled out by future climate change scenarios, natural events, change in practices or a wrong evaluation of the results?
2. How can we ensure that an offsetting scheme is only used as a last resort mechanism, after avoidance and reduction of emissions?

On question 1, only the risk of a change in practice is discussed. Article 6 of the proposal addresses the issue of long-term storage and proposes that, for carbon farming, the carbon stored should be considered released at the end of the monitoring period. By proposing this methodology, the Commission clearly agrees to the fact that permanence of carbon stocks in agriculture can't be guaranteed or that the cost for monitoring would be too expensive for the farmer or credit buyer. Moreover, if a company with an offsetting program needs to rebuy the carbon credit every 10 or 20 years, the current configuration will lead to lower prices of carbon credits originated from carbon farming.

As we've discussed previously, low prices can lead to low revenues for farmers but conversely will not convince the potential credit buyers to reduce emissions in the first place.

The proposal, although stating its importance in its context, does not address the problem of question 2. The Commission recognises that emissions reductions should be the highest priority, before offsetting schemes can help mitigate the hard-to-abate emissions. But the proposal doesn't provide any tools to ensure that such a chain of events is the standard. A mandatory hierarchisation tool should be introduced to ensure that compensation certificates can only be available to buyers that have reliable emissions reduction plans.

Regulation VS key questions from chapter 2: carbon farming as a set of practices

Key questions to keep in mind - Chapter 2: Carbon farming as a set of practices

1. Should carbon farming schemes include all mitigation mechanisms (removals, avoided emissions and reduced emissions)?
2. Should all mitigation mechanisms be certified together or separately?

The regulation proposal is solely focused on carbon removal and emissions reduction from biogenic pools. Biogenic pools are defined as above-ground biomass, below-ground biomass, litter, dead wood and soil organic carbon. On its "knowledge for policy" website section, the Commission defines above-ground biomass as "all biomass of living vegetation, both woody and herbaceous, above the soil including stems, stumps, branches, bark, seeds, and foliage" (European Commission 2018).

If this definition really describes what is intended by the text, then this regulation would exclude a large portion of practices that could reduce GHG emissions on farm. For example, the reduction of CH4 emissions through the adaptation of the feed rations for livestock would be excluded. It is unclear if a reduction in chemical fertilizer use, that would reduce N2O emissions, would be recognised as an emission reduction, as they are applied to a biogenic pool, but the biogenic pool is not the source of the emission. It seems thus that the regulation is prohibitive even to practices proposed in the Commission's own handbook for carbon farming.

These definitions should certainly be clarified. But from what we understand now, the regulation is focusing almost solely on removals and excludes a certain number of practices linked to avoidances and reductions of emissions, although it is stated that those can be disclosed as co-benefits. This narrow frame is not fit to exploit the whole mitigation potential of carbon farming. The ideal carbon assessment of a farm would be a whole-farm assessment, including direct and indirect emissions from exports and imports, in order to maximise the mitigation potential and avoid carbon leakage.

As the proposal mostly tackles removals, it does not address question 2. But in the case where the regulation would in the end integrate all mitigation mechanisms, their translation into corresponding and appropriate certificate types should be discussed.

Regulation VS key questions from chapter 3: carbon farming as a business model

Key questions to keep in mind - Chapter 3: Carbon farming as a business model

1. How can we design a carbon farming scheme that combines high inclusivity for all farmers with low levels of uncertainty? How can we balance entry and MRV costs with the certainty of results?
2. How can we ensure that farmers who have already taken steps towards resilience can also be rewarded?
3. How can we ensure the permanence of the results? Or how can we design a carbon farming scheme where uncertainty about permanence has less impact on climate change mitigation?
4. How can we ensure the additionality of the results, especially when considering the CAP?
5. How can we ensure that there is no carbon leakage in a carbon farming scheme?
6. Should the mitigation results be assessed against a baseline scenario? What methodology should be used to define a baseline?
7. How can we ensure that carbon farming doesn't impact land prices and accessibility for farmers?

The regulation excludes many potential farmers and simultaneously is also too broad. It barely discriminates between nature-based removals and industrial removals. It was developed as a catch-all methodology for all carbon removal activities. Therefore, it lacks concrete information on specific risks inherent to specific removal activity types. It leaves the door open to a variety of certification schemes, which is not negative in and of itself. But the criteria on which the Commission will base its decision for approval are too vague to ensure that greenwashing schemes be rejected. In the case of carbon farming, it leaves many of the key questions it should tackle open.

Who would bear the MRV cost is a central issue of carbon farming as those costs could be prohibitive to numerous farmers. The proposal does develop on the necessity of quality results and refers to IPCC tier methodology as a reference. But the quality of results strongly depends on the MRV costs which, if too high, would exclude a large number of small and medium farms. It would also enhance the potential for land grabbing. This need for balance is not discussed in the proposal.

The proposal develops further on the results and establishes rules for defining baselines to which the removals can be compared. That means that in most cases, the removals will be at least partially

assessed through modelling, reducing the cost but increasing the margin of error of the results. The rules for the baseline seem to indicate, although they are quite broad, that the baseline would be a regional mean. This leaves the door open for certification schemes that would reward past efforts made by farmers, as their farms could be compared to the current baseline and retroactively rewarded. But it does not make it mandatory.

Concerning additionality, the proposed regulation demands that a carbon removal activity goes beyond statutory requirements and takes place because of the incentive effect of the certification. What the statutory requirements are is left to interpretation. In the case of agriculture, stricter definitions must be introduced to ensure compatibility with the CAP. Moreover, it does not explain what the procedure would be when the statutory requirements evolve during the implementation or monitoring period of an activity.

The regulation elaborates partially on some of the risks of carbon farming but most of the choices to be made are left open. Even crucial QU.A.L.ITY criteria that the Commission will use to assess proposed certification schemes are unclear. Some other crucial criteria, such as the impact on land accessibility or carbon leakage have not been addressed at all.

These criteria will be examined in the next chapters.

Regulation VS key questions from chapter 4: voluntary carbon markets and carbon credits

Key questions to keep in mind - Chapter 4: Voluntary carbon markets and carbon credits

1. Should carbon credits produced through carbon farming be purchasable by speculative investors or end buyers only?
2. Should industries registered in the compliance market (ETS) be able to buy carbon credits from the VCM?
3. How can we differentiate carbon credit buyers that are offsetting to avoid emissions reductions from those who are offsetting as a last resort method for hard to abate emissions?
4. Should carbon credits offer compensation rights in all cases?
5. What mechanism could ensure that there is no double-counting of the offsets on a national and international level?
6. Should we create specific VCMs for carbon farming to ensure their efficiency? What should be the size of those VCMs and what buyers should access them?
7. How can we ensure VCM transparency?

The proposal doesn’t discuss the issues linked to VCMs and carbon credits at all. It focuses only on certification mechanisms and doesn’t state if a future regulation on VCMs will be needed or presented.

It only proposes to keep track of certificates produced by establishing registries. But once the certificate is delivered to a VCM, the rules are to be defined, or not.

As we've explained in chapter 4, VCMs are unregulated markets that emerge spontaneously. In the case of carbon farming, there are risks that an unregulated VCM could not ensure stable revenues for farmer, prevent agricultural land grabbing or avoid perverse offsetting strategies from companies that are not reducing their emissions. Many characteristics of a VCM where carbon farming certificates are sold should be discussed and it would be necessary to design carbon farming specific VCMs.

- VCMs could be assigned to specific perimeters, like a region, and to a specific sector. Offset buyers could thus directly finance the transition of their own supply chain and local dynamics of transition could be enhanced.
- Minimum prices could be introduced to ensure stable revenues for farmers.
- Most importantly, it is not a fatality that issued certificates would authorise emission compensation.

All those points will be discussed in later chapters when addressing alternatives.

A regional approach to carbon farming

The regulation proposal does not provide any tools for carbon farming to be adapted locally to accompany a broader transition of agrarian systems towards agroecology. Because of its large scope, it does not consider crucial aspects of the transition that are specific to the agricultural sector, such as the need to transition to extensive husbandry or the need to reduce reliance on chemical inputs.

The proposal integrates the possibility that a region or local authority could be the instigator of certification schemes. But, even if it is not the case, it should integrate the fact that regional and local authorities must be implicated into any certification schemes.

Regional and local authorities can guarantee the development of projects based on cooperation within the supply chain and provide the link to territorial needs as well as to regional strategies for reducing agricultural greenhouse gases. They play a fundamental role in the technical training of new entrants, assistance in setting up young farmers, advice to farmers, land and urbanistic regulations and the creation of demonstration farms.

Regional authorities could set up VCMs on a territorial scale under their responsibility, establishing a governance framework adapted to local requirements and defining a number of available credits based on a calculation of agricultural emissions and reduction/storage potential.

6. Exploring alternatives

In this section, we will explore alternative models of carbon farming that are being developed in Europe and start reflecting on what these models can teach us in terms of elaborating a coherent proposal for a European carbon farming program.

The case for a non-compensatory credit: Soil Capital in Belgium, France and the UK

Soil Capital is a company that assists farmers in transitioning towards regenerative and profitable agriculture. At first, Soil Capital was solely focussing on managing and advising farms with an equal focus on reducing carbon impacts as other parameters such as biodiversity or water protection. In 2019, they started to explore possibilities of remunerating farmers for transitioning through the sale of carbon certificates on the VCMs (Soil Capital n.d.).

Soil Capital's approach of carbon farming

Table 3: Synthesis of Soil Capital's carbon farming method (source: own interview with Soil Capital and (Soil Capital n.d.))

	Soil Capital method
Mitigation mechanisms	Removals and emissions reductions are all considered by Soil Capital. For the time being, livestock is not included in the calculation as Soil Capital considers that the methodologies, often based on the carbon intensity metrics, are not efficient enough. In the future, they hope to include it and provide whole-farm analyses.
Certification methodology	The approach is hybrid with soil testing only before and after the program for calibration of the modelling. Farmers are compared to regional baselines and farmers that are net emitters and net stockers before the program can all take part. The program is thus inclusive to farmers that have already transitioned in the past.
MRV costs	The costs are borne by the farmer but limited because the MRV is mostly based on modelling.
Permanence	Carbon release or emissions increase are dealt with if the origin is a change in management by the farmer. An insurance reserve is set up in the first year. 20% of the certificates generated are placed in this reserve. Those can only be sold after 10years of monitoring.

Additionality	Dealing with the CAP is a challenge. Their farmers need to go beyond CAP conditionalities but those can change in the middle of a program. Their program is also in competition with eco-schemes.
Carbon credits: the risks of offsetting politics	Soil Capital produces ISO carbon certificates. Those carbon certificates do not allow a company to offset its emissions and declare itself carbon neutral, unlike other carbon credits available on VCMs.

Non-compensatory carbon certificates and minimum prices

Those carbon certificates produced by Soil Capital do not give the opportunity to the buyer to offset its emissions and declare itself carbon neutral. Even though we might think that offsetting would be the sole interest of buyers, Soil Capital is observing a large interest in its carbon certificates. Three years after the beginning of the program, 200,000ha of farms are already covered by the program and the goal is to reach 1 000 000ha by 2025.

The interest in those carbon certificates is mainly due to the fact that they are sold to two types of buyers only. The first are food companies purchasing raw materials in France, Belgium and the UK who want to reduce the emissions linked to their supply chain. Agri-food companies have climate objectives that go beyond their own direct emissions. They also have goals for reducing their indirect emissions linked to the production of raw materials (scope 3 emissions). By buying those carbon certificates, they can't declare carbon neutrality of their own business, but they can declare improved carbon balance of their supply chain. The second type of buyers is non-agri-food companies that use the carbon certificates to contribute to the decarbonisation of their region. In return, they can use it as a marketing argument.

Soil Capital also introduced minimum prices for the carbon certificates, thus ensuring that the farmers are not losing money in the program (even though the certificates still have to be sold).

This financial approach that excludes compensation from buyers substantially reduces many risks of carbon farming for climate change mitigation. There is no risk that offsetting from buyers would postpone reduction efforts. Although permanence is still an issue, we avoid the worst-case scenario where a company's offsets would later be released. Finally, limiting the buyers to agri-food and regional companies also helps to induce local dynamics of transitions and coherent supply-chain transformations.

Key lessons - Alternative n°1: Soil Capital and the case for a non-compensatory credit

- Carbon farming companies are developing efficient certification methodologies based on removals and all types of reductions. The best way to assess a climate impact would be a whole farm scenario.
- Certification methodologies based on regional baselines can be inclusive for all farmers.
- There needs to be more complementarity between carbon farming and the CAP to account for additionality.
- Non-compensatory carbon certificates are a safer approach to climate change mitigation because they prevent abusive offsetting politics.
- Non-compensatory carbon certificates are interesting to buyers, either to improve their supply-chain impact or for marketing opportunities.
- A financial model that includes minimum prices can be efficient.
- Constituting a certificate reserve can help to reduce permanence risks.

The case for a regional carbon farming: Rete Rurale Nazionale in Italy

If climate change must be assessed on a global scale, its effects will be specific to local ecosystems. Approaching climate change mitigation with local and regional strategies can allow for compatible preventive solutions and adaptations. Zooming in on a territory, especially in regard to agriculture, allows for the design of tailored solutions, with lower chances of producing unpredictable undesirable effects and better chances to create transition dynamics.

As we explained in chapter 5 when analysing the Commission's proposal, regional or local authorities could decide to be instigators of carbon farming certification scheme. They also could create a specific VCM for their scheme. Rete Rurale Nazionale (RRN) proposed a methodology to implement what could be called a district certification scheme for carbon farming. The certificates sold, called sustainability credits, are produced mainly through the implementation of agroforestry and sold to livestock farmers. This project can teach us valuable lessons on regional governance of carbon farming.

RRN's approach of carbon farming

The basic functioning of the system proposed is the same as a large-scale certification scheme. Farmers can decide to implement new practices and produce certificates; these are called sustainability credits. In this case, it is mostly agroforestry practices that are implemented to produce sustainability credits that will be bought by livestock farmers.

Table 4: Synthesis of RRN's carbon farming method (source: RRN's methodology)

	The RRN method
Mitigation mechanisms	The mitigation mechanisms considered are removals and all reductions.
Certification mechanism	The main idea of the project is that the certification scheme is limited to a district. In this case, the district is defined as a territorial entity characterised by a considerable agroforestry potential and a dominant livestock sector. But the definition could be adapted to specific regional needs if the model is expanded. More details on specificities in the next section.
Permanence	A study on the risks of anthropogenic and natural carbon release is carried out for each project. On the basis of this estimate, a number of credits

	(often 25%) will constitute a buffer reserve that will only be sold if a certain level of permanence is reached. If an event releases more than what is in the reserve, future credits will be held back until the balance is reached.
Additionality	The measures implemented must go beyond current regulations. If a farm receives subsidies from another public (CAP or other national programs) or private agency, they can't use the results to produce credits.
Carbon leakage	The methodology includes a decrease in credits produced to counter-balance for eventual carbon leakage. Each practice's leakage potential is evaluated in the methodology and a coefficient is correspondingly applied. As much as 50% of the credits can be blocked to account for possible leakage.
Carbon credits	Contrary to the carbon certificates produced by Soil Capital, those sustainability credits are offset credits and can be used to achieve net-zero goals. But those credits can only be sold inside the district. Livestock farmers are the main buyers, but other local actors (local firms, citizens…) can also buy the credits. The sustainability credits have a quantitative component which is a tonne of CO2eq, but qualitative components as well (e.g. water protection, biodiversity, job creation, food quality…). Contrary to a large-scale scheme, these sustainability components can be easily observed by the credit buyer, as he/she is located in the same district.

Governance modalities: the actors

To begin a program in an area, the geographical perimeter of a district must be established, and an institutional governance body must be identified or created to lead the project. The body must include representatives of a local public institution (region, municipality…) and a control room must be created. The control room will deal with the implementation and monitoring of the program. Before the program can begin, a participative and inclusive process with all implicated actors must have been led by the governance body.

The project will be assessed by a higher authority that functions around a technical-scientific committee to be sure it conforms to the standards and regulations. In the case of RRN, the higher authority is the ISMEA (Institute for Agricultural and Food Market Services). All district projects must also be displayed for public consultation for a minimum of thirty days.

Overall, the program brings together four types of actors:

1. Higher authority with a technical-scientific committee
2. District governance body with a control room

3. Credit sellers
4. Credit buyers

A specific methodology for quantification of the mitigation results must be assigned to each eligible activity.

All the participants, buyers and sellers of credits, can then use a logo for marketing purposes.

Governance modalities: the MARC approach

The possibility of purchasing offset credits should not constitute a right to pollute. Climate change mitigation actions should therefore be implemented in a chronological order. For that purpose, every credit buyer must comply with the MARC approach: measure, avoid, reduce, compensate.

Before being able to buy sustainability credits, the buyer must prove that he/she took all the measures to avoid and reduce its emissions first. For that purpose, a clear rulebook for avoidance and reduction practices must be determined by the managing authorities. In the case of RRN, as the majority of the buyers are livestock farmers, the rulebook would mainly outline avoidance and reduction practices linked to livestock management. In another configuration of the same type of program, this rulebook should be adapted to the context of the buyers. In any case, it will be easier to have an efficient MARC approach if the diversity of buyers is not too high.

Contrary to the compensating practices of the program, the compliance with MARC for buyers can be achieved by using other types of funding (public, private…).

Governance modalities: public registries

The district governing body will implement a registry of activities and credits accessible on a public website. Each district will manage its own registry, but the registries of all the districts should be transparent and comparable with each other. A common website managed by the higher authority will display all the registries.

The districts, their registries and all the actors involved in the program should be geo-referenced on the common site. All credits must be trackable, and the registry has to be constituted of two sections: one dispatching all the data on the emissions of the credit buyers and one dispatching all the data on the credit produced.

This methodology will also ensure that the credits can only be traded inside the district.

Governance modalities: credit generation

The monitoring period during which credits can be issued will vary according to the type of practice implemented. It can range from 10 to 20 years. The sold credits are not the property of the buyer who can’t resell them.

In order to guarantee the transparency and credibility of the credits produced, the effective and correct implementation of the practice will have to be verified by the district governance body. To this end, spot checks have to be organised.

Key lessons - Alternative n°2: the case for a regional carbon farming

- The regional governance of carbon farming can ensure the integrity of a certification scheme as it allows to easily implement innovative governance tools.
- On a regional level, it is easier to ensure that compensations are permitted only after avoidances and reductions have been implemented. The MARC approach is one way to do this.
- On a regional level, it is easier to ensure that carbon farming enhances local dynamics of transition, through the collaboration between close actors and under the supervision of a managing authority that has a complete view of the district's emissions and issued credits.
- Transparent and thorough public registries can ensure the credibility of carbon farming projects on a regional level.
- On a regional level, the sustainability co-benefits of implemented practices can be easily assessed and verified.
- VCMs can be restricted to small areas and still be effective. The actors involved in the VCM can easily be checked for compliance with the rules of participation of the market.

Additional alternatives for specific carbon farming issues

A lot of different legislative tools could be introduced to better frame carbon farming. In this study, we've extensively presented two alternative models for carbon farming that could teach us some lessons. But other pre-existing legislative tools that are not yet linked to carbon farming could also be used or inspire new ideas. To conclude the chapter on alternatives, we want to present three of them.

Capping carbon farming to limit the impact on land prices and accessibility

As discussed in chapter 5, the regulation proposal does not address the topic of land prices and accessibility. It is however a crucial topic. Empirical studies have shown that agricultural subsidies, mainly through CAP direct payments, are capitalised on land prices (European Commission. Joint Research Centre. 2021). Large land owners have also been shown to grab consequential amounts of subsidies. The CAP has been a key cause for the increase in farm size and the disappearance of small and medium family farms in Europe. Carbon farming will most definitely produce a similar effect.

As explained in chapter 3, Australia has dealt with this issue. Their carbon farming program, launched in 2011, caused a land rush by investors. Therefore, the government had to put forward legislation that allows them to veto carbon farming programs exceeding 15ha (Grain 2022).

Capping carbon farming revenues could indeed be a very useful tool to limit land speculation. It could be introduced through a cap on revenues (as it is proposed in the CAP but not mandatory) or area of the project (as it is done in Australia). Capping also promotes fairness, as it induces better distribution of wealth.

Other CAP tools can also be translated to carbon farming. Clear definitions of who could profit from carbon farming revenues should also be introduced. The recipient of those revenues should be an active farmer and the definition should not exclude small scale farms. Moreover, it would also be essential to build a list of recipients that would be excluded from receiving such revenues (inspired by Metta 2022).

Real Environmental Obligation in France

Real Environmental Obligations (REO) are enshrined in a contract whereby the owner of a property puts in place environmental protection attached to the property, for a period of up to 99 years. As the obligations are attached to the property, they continue even if there is a change of ownership. The purpose of the contract must be the maintenance, conservation, management or restoration of biodiversity or ecosystem services.

When we think about the issue of permanence, the REO could be introduced as a tool to solve at least half of the permanence problem, which is release of stored carbon due to anthropogenic causes. But even with REOs, environmental disruptions would still be a great threat to permanence. Introducing REOs are thus mostly useful if it is ensured that natural disturbances would be limited. This of course depends on the good-faith that practices have been implemented in low-risk areas and that future

climate change is limited, for example by generalising MARC approaches to all climate change mitigation mechanisms, not only carbon farming.

Public procurements

Public procurements can offer large market opportunities to the private sector. Ideally, those deals should only be concluded with private companies that comply with the highest social and environmental standards. If we follow the example of Soil Capital and decide that carbon farming can't produce compensation credits, reserving the access to public procurements to agri-food companies that are financing carbon farming practices could be an alternative type of reward (as compared to the possibility of offsetting).

Key lessons - Additional alternatives: REOs and public procurements

- Capping carbon farming revenues could limit land grabbing and ensure e better distribution of carbon farming revenues.
- Clear definitions of who can and who can't receive carbon farming revenues should be established.
- REOs can ensure that anthropogenic causes of carbon release are avoided on the long term.
- Public procurements can be an additional reward for companies that buy carbon certificates that would not allow compensation of emissions.

7. Is carbon farming CAP compatible?

Regulating carbon farming on its own comes with various risks of incoherencies with the CAP. Here we will shortly discuss three questions that summarise some of the biggest risks, two being technical and one being more ideological.

How can we define additionality when considering the CAP?

If the basic rule for additionality, which is going beyond the GAEC standards, seems to be quite clear, it is unclear how this rule will apply in practice. Indeed, the GAECs can change every seven years. It would be essential to define clearly how the additionality will be adapted when GAECs change.

A carbon farming program can be divided in many steps. First there would be some prospection with existing entry costs for soil sampling or knowledge sharing. Then there would be an implementation period followed by a monitoring period. For each situation, it should be clear if a change in GAEC would retroactively impact the program (entirely or partially).

In a case where new GAEC rules are not retroactive at all, it could create a rush to develop carbon farming before new CAP implementations where the future rules are stricter. This would create a situation where a lot of farmers could end up being paid to implement future GAEC standards when it should not be the case.

It is also important to consider that stricter GAEC standards would reduce the economic opportunity of carbon farming. A large development of carbon farming in Europe could lead to complicated negotiations for the future GAEC standards of the 2027-CAP.

How can we avoid competition and double funding between CAP and carbon farming?

We can already observe some competition between the new CAP and already existing carbon farming programs. For example, in Wallonia, two new eco-schemes are proposing carbon farming type practices (soil covers; chemical input reduction). In the future, it would be essential, for the development of both legislative tools, to avoid creating competitions.

Double funding might also become an issue if carbon farming overlaps with CAP practices. For example, what would happen if a farmer registers for a private carbon farming program and, two years later, decides to transition to organic agriculture? In the case of carbon farming, chemical inputs have to be reduced but some can still be used. But an organic farmer has to cut off chemicals completely. How much of the CAP organic transition subsidy could this farmer receive in addition to the carbon farming remuneration? It would be necessary to determine all those double funding scenarios and to define clear proportional rules for each of them.

To what extent should we accept that private funding replaces public funding in agriculture?

This question is partially ideological, as the debate between increasing public budgets and opening financing to the private sector is a fundamentally partisan question that this study will not settle. But, in the case of carbon farming, it is not only that. There is a purely technical difference in that private carbon farming might allow for carbon compensation for private companies when public funding does not. As we've extensively discussed, offsetting politics can have a perverse effect on climate change.

It is also important to note that in the existing cases of carbon farming, public funding is often used to finance development costs and to cover some entry costs such as knowledge sharing, or new farm equipment purchases. This strategy of limiting costs while grabbing parts of the benefits is recurrent in private strategies.

In our view, private funding in agriculture should always remain a booster to complement public funding in order to ensure that our agrarian systems can be shaped democratically and that farmers can be protected.

8. Conclusion

The first clear conclusion to be made for the future of carbon farming in Europe is that the proposed regulation on carbon removals is completely unsatisfactory. It doesn't provide clear answers on any crucial risks of carbon farming. Astonishingly, it is both too broad and too narrow in its approach. Therefore, it is essential to start over and propose a regulation for carbon farming on its own.

This study provides extensive information, data, lessons and tools to be considered when preparing a future regulation on carbon farming. **A synthesis of all the lessons discussed throughout the study has been compiled in the Annex**.

Aside from presenting an understanding of stakes and issues of carbon farming, this study provides the opportunity to collaborate with actors on the ground that share a deep concern about the future development of carbon farming. To illustrate this, I would like to conclude by sharing how the collaboration has begun in the municipality of Plessé, in France.

At the start of the study, I contacted the municipality of Plessé, members of whom I met during an ARC2020 event on rural resilience hosted in their municipality. I wanted to see if small administrations were interested in the topic of carbon farming and willing to lead a reflexion on local implementation. Immediately, they showed interest and started to create a carbon farming team. With the short deadline of this study, we only had the time to organise one meeting with the team, but I was amazed by how various members of society became involved with this topic, some of them using their free time.

The project attracted members of the administration, unions, cooperatives and farmers. The municipality of Plessé is even interested in being a test unit for a local implementation of carbon farming, integrating innovative and democratic governance tools in the process.

Although we didn't have the time to produce conclusions on the topic, this collaboration can already teach us a valuable lesson: **There is a will and energy for a bottom-up approach to carbon farming**. Civil society organisations, farmers and citizens want to get involved with this topic and their energy should be used to work on finding solutions to the various carbon farming issues.

As we've shown in this study, local implementation of carbon farming can provide tools for reducing its risks. We can now be assured that investment and interest from local authorities and concerned citizens will not be the limiting factor.

Annex

Synthesis of our key questions and key lessons

Key questions	Key lessons
how can we prevent that an offsetting scheme is not cancelled out by future climate change scenarios, natural events, change in practices or a wrong evaluation of the results?	• Changes in practice can be avoided by introducing long term contracts such as OREs • Carbon credit reserves can provide a buffer for natural events and practice changes. • Limiting climate change is the most important factor for ensuring stability of carbon stocks in the future. For carbon farming specifically, MARC approaches and non-compensatory certificates can be implemented to avoid the perverse effects of offsetting politics on climate change.
How can we ensure that an offsetting scheme is only used as a last resort mechanism, after avoidance and reduction of emissions?	• For carbon farming specifically, MARC approaches and non-compensatory certificates can be implemented to avoid perverse offsetting politics and ensure chronological order of mitigation actions.
Should carbon farming schemes include all mitigation mechanisms (removals, avoided emissions and reduced emissions)?	• Including all mitigation mechanisms allows for developing whole farm scenarios that help avoid carbon leakage. They are also more inclusive to all farm types.
Should all mitigation mechanisms be certified together or separately?	• To be discussed in future research
How can we design a carbon farming approach that combines high inclusivity for all farmers with low levels of uncertainty? How can we balance entry and MRV costs with the certainty of results?	• Hybrid approaches offer the most flexibility. • Non-compensatory carbon certificates require less certainty of results and are thus more inclusive.
How can we ensure that farmers who have already taken steps towards resilience can also be rewarded?	• This can be ensured by comparing their current situation to regional means for similar farms. If they are performing better than the mean, they could be rewarded for that (e.g. Soil Capital).
How can we ensure permanence of the results? Or how can we design a carbon farming scheme where uncertainty about permanence has	• Changes in practice can be avoided by introducing long term contracts such as OREs

less impact on climate change mitigation?	• Carbon credit reserves can provide a buffer for natural events and practice changes. • Limiting climate change is the most important factor for ensuring stability of carbon stocks in the future. For carbon farming specifically, MARC approaches and non-compensatory certificates can be implemented to avoid the perverse effects of offsetting politics on climate change.
How can we ensure additionality of the results, especially when considering the CAP?	• Rules about the impact of changing GAEC standards on additionality need to be specified. Especially how a change would impact ongoing projects. • We need to consider that fast growing carbon farming in Europe could make it difficult to negotiate for more ambitious GAECs in 2027 as this would reduce the economic opportunity for carbon farming.
How can we ensure that there is no carbon leakage in a carbon farming scheme?	• Clear emissions registries need to be made publicly available. • Whole farm certification methodology can prevent local leakage.
Should the mitigation results be assessed against a baseline scenario? What methodology should be used to define a baseline?	• Baselines that are based on regional means for similar activities can allow to include farmers that have made efforts in the past. They also minimise the possibility to inflate results compared to business-as-usual farm specific baselines.
How can we ensure that carbon farming doesn't impact land prices and accessibility for farmers?	• Capping carbon farming revenues can help minimise the impact on land prices. • Defining a list of possible recipients, excluding land owners that are not active farmers, could also limit land speculation.
Should carbon credits produced through carbon farming be purchasable by speculative investors or end buyers only?	• Only end buyers should be able to buy credits or certificates to avoid speculation.
Should industries registered in the compliance market (ETS) be able to buy carbon credits from the VCM?	• Purchasing carbon credits should mostly be possible in closed districts to boost local dynamics of transition and avoid perverse effects of offsetting schemes. Purchasing inside the sector (agri-food) should also be prioritised to increase funding for the reduction of indirect emissions and boost supply-chain transitions.

How can we differentiate carbon credit buyers that are offsetting to avoid emissions reductions from those who are offsetting as a last resort method for hard to abate emissions?	• A regional approach of carbon farming and VCM can allow authorities to control who purchases the credits through clear registries. • MARC approaches are necessary and easier to implement efficiently on a regional level. • Introducing non-compensatory certificates allows to dodge offsetting issues.
Should carbon credits offer compensation rights in all cases?	• The concept of non-compensatory certificates must be discussed. • Hybrid systems with both certificate types could be discussed as well. Offsetting rights could be given under certain conditions such as respecting a MARC approach.
What mechanism could ensure that there is no double-counting of the offsets on a national and international level?	• Clear public and comparable registries on emissions and credits must be implemented. • Regional implementation can provide better overview of the evolution to avoid double-counting.
Should we create specific VCMs for carbon farming? What should be the size of those VCMs and what buyers could access them?	• Carbon farming specific VCM could be implemented on a regional level. • A regional approach of carbon farming and VCM can allow authorities to control who purchases the credits through clear registries. • MARC approaches are necessary and easier to implement efficiently on a regional level. • Certificates should only be purchasable in closed districts to boost local dynamics of transition and avoid perverse effects of offsetting schemes. Purchases inside the sector should also be prioritised to increase financing for the reduction of indirect emissions and boost supply-chain transitions.
How can we ensure VCM transparency?	• Clear public and comparable registries on emissions and credits must be implemented. • Regional implementation can provide better overview of the evolution to avoid double-counting.

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