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Short Communication

Note on carbon sequestration policies in the European Union

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Abstract

This note examines the state of carbon farming (CF) policies in the European Union (EU), highlighting their potential to deliver significant public benefits, such as improved soil health, air quality, and climate mitigation. The existing mechanisms for encouraging carbon sequestration and evaluating alternative support scenarios are assessed, starting from analysing the regulation on carbon sequestration certification adopted by the European Parliament and the Council following a proposal from the European Commission. This note analyses the integration of CF into the EU's Common Agricultural Policy (CAP) through cross-compliance measures, eco-schemes, and Rural Development programmes. Additionally, it explores potential CF support frameworks, including exclusive reliance on the first CAP pillar, the voluntary carbon market, and mixed approaches. The analysis highlights several trade-offs: balancing CAP budget limitations with the need for stronger environmental measures, mitigating market uncertainty in the voluntary carbon market, and ensuring that certification costs do not deter farmer participation. Despite these challenges, the findings suggest that including CF within CAP, either as an alternative or complement to the voluntary carbon credit market, could enhance carbon sequestration and align EU agriculture with climate neutrality goals, particularly when supported by a structured certification system.

Keywords: carbon farming, carbon credits, soil carbon accounting, climate neutrality goals, CAP budget, carbon sequestration certification

JEL codes: Q18

Highlights:

- The European Union is currently adopting a regulation for the certification of carbon sequestration in the farming sector.
- Remuneration for carbon farming could be part of the next Common Agricultural Policy reform.
- Balancing public support between paying for carbon farming practices and fostering the market for carbon credits is crucial.

1. Introduction

In a world where demographic and economic growth have led to a steady increase in food consumption, there has been significant pressure on natural resources, as global agricultural production has intensified over the years (Hu *et al*., 2020). Consequently, greenhouse gas emissions have increased, necessitating appropriate environmental policies aimed at countering the sector's impact (Vojtech, 2010). In the European Union (EU), considering data published by the European Commission (EC) and contained in the Emissions Database for Global Atmospheric Research (EDGAR), from 1990 to 2021, the total greenhouse gas emissions from the agricultural sector decreased from 485 Mt CO_2 equivalents to 378 Mt CO_2 equivalents, representing a 22% reduction (EC, 2023). This decline signals an improvement and indicates the partial, yet limited, effectiveness of the tools adopted in relation to the budget allocated for the ambitious goal of achieving climate neutrality by 2050 (European Court of Auditors, 2021).

Among the strategies for climate change mitigation and adaptation, carbon farming (CF) is defined as a green business model that rewards land sector actors for adopting better land-management practices that result in carbon sequestration in living biomass, dead organic matter, and soils, thereby increasing carbon capture and/or reducing carbon release into the atmosphere (EC, 2021a). Based on this definition, it is clear that environmental objectives can be achieved through the adoption of two main CF practices: (1) reducing greenhouse gas emissions and thus the carbon footprint of agricultural, forestry, and livestock activities (De Boer *et al*., 2011), and (2) increasing soil carbon absorption, such as the preservation of peatlands (Joosten *et al*., 2014) and increasing

organic matter in agricultural soils and the biomass of crops, both intercropping annual crops (Francaviglia *et al*., 2017) and multi-year arboreal and forestry crops (Bernal *et al*., 2018).

The purpose of this note is to briefly outline the status of CF policies in the EU, considering the instruments currently in place and comparing alternative scenarios for supporting carbon sequestration activities implemented by farmers.

2. The state of the art of carbon farming policies in the European Union

In its communication on "Sustainable Carbon Cycles – Carbon Farming", the EC (2021a) reiterated the need to remunerate entrepreneurs who, through their activities, demonstrate carbon dioxide absorption, thus generating carbon credits. At present, direct remuneration for CF activities in the agricultural sector occurs through the voluntary carbon market, where farmers can generate and sell carbon credits. Certification is required to validate these credits, which must be obtained through accredited entities (Michaelowa *et al*., 2019; Criscuoli *et al*., 2024). This voluntary market is different from the EU-regulated carbon market, known as Emission Trading System (ETS), which was established under the provisions of the Kyoto Protocol (United Nations Framework Convention on Climate Change, 1998).

The ETS imposes legally binding caps on greenhouse gas emissions for sectors such as energy and industry, requiring participants to trade allowances within a strictly regulated framework. In contrast, the voluntary market provides non-regulated entities – such as individual farmers and smaller landowners – with the opportunity to contribute to climate change mitigation efforts by adopting carbon sequestration practices (Criscuoli *et al*., 2024; Gołasa *et al*., 2025). However, this market is volatile and has not yet been widely exploited by farmers (Battocletti *et al*., 2023). Given that this voluntary market is more volatile and less attractive than a regulated market (Battocletti *et al*., 2023; Marchewka-Bartkowiak, 2023), it is necessary to standardise carbon sequestration quantification methodologies to determine the amount/number of credits that can be generated by farmers based on the activities performed (Smith *et al*., 2020; Van der Vort *et al*., 2023; Van Hoof, 2023).

For this reason, the EC has published a draft regulation, enacted recently by Regulation No. 2024/3012, which outlines the minimum criteria for classifying farmers' activities as carbon sequestration practices, summarised by the acronym QU.A.L.ITY., which stands for Quantification, Additionality, Long-term storage, and Sustainability (EC, 2022; Günther *et al*., 2024). The QU.A.L.ITY. system is at the core of the EU's effort to establish a robust certification framework for carbon sequestration practices, aiming to address some of the key challenges related to measuring and verifying carbon sequestration, ensuring credibility and consistency across EU Member States:

1. QUantification: activities must be measured accurately and provide unequivocal sequestration benefits. The additional sequestration generated by an activity compared with a baseline scenario should exceed the greenhouse gas emissions caused by its implementation across the entire life cycle. The net carbon sequestration benefit should be validly and accurately quantified.
2. Additionality: sequestration activities must go beyond standard practices and legal requirements. To demonstrate additionality, it is necessary to define a "normalised" baseline scenario that accurately reflects standard practices, regulatory frameworks, and market

conditions in which the activity takes place. This baseline scenario allows for objective and cost-effective demonstration of additionality and recognises the early commitment of land managers and industries that have already undertaken carbon sequestration activities.

3. Long-term storage: CF activities must ensure that the absorbed carbon is stored for as long as possible, with minimal risk of release. Certificates will specify the duration of storage and distinguish between permanent and temporary storage.
4. Sustainability: CF activities must leave other environmental goals, such as biodiversity, climate change adaptation, greenhouse gas emission reduction, water quality, zero pollution, or a circular economy, unaffected or generate additional benefits.

The importance of this framework – although at present it is general and will be regulated in detail through future delegated acts – reflects the EC's clear intent to make progress on certification while remaining within the voluntary market. Indeed, the report produced as a conclusion for the "Strategic Dialogue on the Future of European Agriculture" (Strohschneider, 2024) reiterated that this could represent "a market-based opportunity to reward sustainable agricultural practices", and pays close attention to uncertainties associated with this sequestration, which should not fall solely on the farmer.

3. Current carbon-farming-related measures in Common Agricultural Policy

Currently, in the EU, the Common Agricultural Policy (CAP) provides payments to farmers for voluntarily adopting agricultural practices aimed at reducing emissions, such as conservation agriculture, cover crops, sowing of crops for ecological purposes, fallowing of arable land, and the promotion of forestry and afforestation practices (EC, 2021b; Criscuoli *et al*., 2024). These measures are part of the first CAP pillar, specifically under cross-compliance of direct payments and eco-schemes. While these are designed and financed at the EU level, their application and specific measures depend on national strategies. Italy's CAP Strategic Plan serves as an example of how EU policies are translated into national-level interventions, offering practical insight into CF implementation in a specific country. Concerning conditionality, CF-related activities include Good Agricultural and Environmental Conditions (GAEC) standards 1, 2, 3, 6, 7, and 9, which relate respectively to "maintenance of permanent grassland", "protection of wetlands and peatlands", "ban on stubble", "minimum soil coverage", "crop rotation", and "ban on conversion or ploughing of permanent grasslands in Natura 2000 sites". Regarding voluntary measures, and referring to the Italian case as an example, carbon sequestration is promoted through eco-schemes 2, 3, and 4, which include "greening of arboreal crops", "protection of landscape olives", and "extensive forage systems with crop rotation", respectively (Italian CAP Strategic Plan, 2023).

In the second pillar, several CF practices are included under Italy's Rural Development measures "typology A – commitments related to the environment, climate, and other management commitments" and "typology D – investments" (Italian CAP Strategic Plan, 2023). These are mainly agronomic and forestry interventions whose direct consequences include medium-and long-term carbon footprint reductions (Willard, 2023), either through emissions avoided or carbon accumulated via afforestation or the addition of organic matter (McDonald *et al*., 2021). What is remunerated is the agricultural practice itself, as the farmer provides an ecosystem service through its execution. The increasing benefits of the practices come from actions that do not alter land use, such as no-tillage, or more impactful practices like afforestation (Dumbrell *et al*., 2016). Specifically, no area-based

measures or other incentives are tied to a specific quantity of carbon absorbed per surface; rather, carbon storage is considered a consequence (Italian CAP Strategic Plan, 2023).

While Italy represents a relevant case study, it is important to recognise that CF policies and their effectiveness vary across the EU Member States due to differences in agricultural systems and soil types. For example, northwestern Member States, such as France and the Netherlands, emphasise carbon sequestration through peatland restoration (Carbon Connects, Care Peat, 2023), while southern Member States, including Spain and Greece, focus on afforestation and soil organic matter enhancement due to their arid climates (Lilas4soils, 2025). These regional differences highlight the need for more flexible CAP measures tailored to the local contexts to maximise CF adoption and effectiveness.

4. Carbon farming: Common Agricultural Policy or voluntary (or regulated) market?

With the commencement of Regulation No. 2024/3012, a legal basis was created for a certification protocol of agricultural practices, albeit still generic. If CAP intervenes, should CF support remain under the second pillar, or could dedicated first-pillar payments accelerate mitigation? Five scenarios are proposed (Table 1).

Scenario 1 – The current situation ("status quo")

Currently (Scenario 1, Table 1), remuneration is guaranteed through a variety of tools (direct payments, eco-schemes, and second-pillar measures) which, despite providing flexibility, lead to fragmented resources and overlapping measures (Alabrese, Saba, 2023). In this scenario, the only way for a farmer to sell carbon credits is to adhere to the fulfilments of a voluntary certification scheme, without CAP coverage for the costs related to the implementation of such a scheme (i.e., certification and related costs).

Scenario 2 – Only the first pillar

In case of enhanced CF remuneration through the first-pillar direct payments – cross-compliance and eco-schemes (Scenario 2, Table 1) – a larger group of beneficiaries would be reached, because many practices that contribute to sequestration are part of the CAP 2023-2027 cross-compliance (in detail, GAECs), which represents a tool that reaches more farmers than the second pillar (Soussana *et al*., 2010; Olson *et al*., 2014; Willard, 2023; Márquez-García *et al*., 2024). The second pillar, on the other hand, only provides support to incentivise adherence to a certification scheme, allowing the credits to be placed on the voluntary market. This scenario offers a strong incentive to comply with conditionality, also from the perspective of credit commercialisation, and practices would not be perceived solely as a requirement for receiving income support but as an opportunity to diversify income, encouraging farmer participation (Block *et al*., 2024; EC, 2025).

Scenario 3 – Only voluntary carbon credit market

Transferring CF remuneration from the CAP payments to the voluntary market (Scenario 3, Figure 1) could optimise policy spending for environmental outcomes (European Court of Auditors, 2021), as the monetary amount earned from the sale of certificates would provide a diversification of income beyond primary agricultural production and related activities. On the other hand, a lack of

sufficient demand for credits (Wongpiyabovorn *et al*., 2022) could lead to price volatility (World Bank, 2023), resulting in high market uncertainty and low stability of support for farmers' income (EC, 2023).

There is also uncertainty about certification costs, whether they should be borne by farmers or whether they could be subsidised by CAP. In Scenario 3, if costs are high, then they could be a barrier to adopting and maintaining certified CF practices (Mayer *et al*., 2022; Paul, 2023). In general, and aside from Scenario 3, it should be noted that only the establishment of a proper incentive system for certifying credits would allow environmental targets to be met more effectively by farmers (Verschuuren *et al*., 2024).

Scenario 4 – Mixed and additional

In this scenario, in addition to CAP support that incentivises CF practices, the farmer can benefit from the voluntary market of carbon credits, obtained through the European certification system (Reg. No. 2024/3012). Accordingly, there would be double remuneration for commitments, as the farmer would receive compensation from CAP for CF activities beyond the income guaranteed by the market (Günther *et al*., 2024). This is very favourable for farmers, but is difficult to realise, considering the current Multiannual Financial Framework (MFF) aimed at a reduction of the CAP budget, unless increased public goods justify additional spending (Lötjönen *et al*., 2024).

Scenario 5 – Reduced Common Agricultural Policy support and guaranteed market for credits

This scenario envisages CAP support only to cover the costs of CF certification, unlike in Scenario 2. This option may generate a reduction in the MMF budget allocated to the CAP, an option that is particularly favoured by detractors of the CAP and the need to direct MMF to other EU policies. However, this option would be totally opposed by farmers' organisations, which at least demand the invariance of CAP support. The loss of CAP support is compensated through revenues generated by a guaranteed market for credits.

Table 1 illustrates potential implications of the five scenarios and hypothesises how stakeholders influence the decision-making process of CAP. Farmers, through their organisations, can slow down or speed up the process of embedding CF into CAP, based on their readiness to implement the practices and generally advocate for maintaining current MFF budget (Scenarios 1 and 4). Environmentalists, on the other hand, are citizens and organisations who want a greener CAP, supporting stricter environmental measures. They usually advocate the reduction of public support for intensive farms in favour of less intensive ones, following the statement "public money for public goods" (Scenarios 2 and 3).

Other stakeholders who aim for a budget reduction are representatives from non-agricultural sectors (members of civil society and representatives of organisations of workers in non-agricultural sectors), who lean towards increasing the funding for other policies, such as social and cohesion policies, environmental policy, defence and security policies, energy policy, enlargement policy, etc. However, it is also possible to consider another category of stakeholders, namely the "Frugal Four", a group of four fiscally conservative states – Austria, Denmark, the Netherlands, and Sweden – that advocate for strict budget discipline, reduced EU spending, and careful allocation of funds. These countries have been particularly active during budget negotiations, often pushing back against large

financial transfers to economically weaker Member States and favouring financial responsibility and efficiency in the use of EU resources. Representatives from non-agricultural sectors and the Frugal Four are the two groups of stakeholders in favour of Scenarios 3 and 5, where the budget for CF within the CAP decreases.

Finally, although not present in Table 1, it is also possible to identify the neutral stakeholders, those who have little influence over CAP's CF decisions: they are consumers, workers' unions, and international trade institutions such as the World Trade Organization. CF remuneration does not determine changes to product availability and price, and at the same time does not distort international trade. Even regarding labour in agriculture, which is protected and monitored by workers' unions, there would be no substantial deviation, as CF practices would still be adopted with varying degrees of diffusion by the farms themselves, regardless of employment.

Table 1. Scenarios for supporting carbon farming (CF).

Scenario	Description	Possible impacts/implications	Supporters	Opponents
1 – Status quo	CF is supported by both CAP pillars, while certification of credits is not supported	• Flexibility due to the presence of multiple tools, both mandatory and voluntary (Strohschneider, 2024) • Widespread practices throughout the territory as baseline commitments • High fragmentation of financial resources • Low synergy between CAP and credits certification	• Farmers that comply with Good Agricultural and Environmental Conditions standards and Rural Development measures	• Environmentalists • Farmers interested in carbon credits
2 – Only the first pillar	CF is supported only by the first CAP pillar (partially rearranging the current direct payments system, based on cross-compliance and eco-schemes), while there is also budget in the second CAP pillar to incentivise a harmonised certification scheme for CF	• Compliance would be perceived by farmers not as cross-compliance but as an incentive for CF • More beneficiaries are reached for CF, that is, the current receivers of Basic Income Support for Sustainability and eco-schemes • Increasing the total agricultural area on which carbon removals are conducted • The budget increase for first pillar of CAP can support segments of the farming population that have not yet adopted practices that goes beyond the minimum commitments of cross-compliance (Phelan *et al*., 2024) • Reluctance of farmers and their representatives to abandon the current system of direct payments	• Environmentalists	• Farmers interested in income support without cross-compliance (adopters of second-pillar commitments) • Non-agricultural stakeholders
3 – Only voluntary carbon credit market	CF is paid only by the market, while the European Union supports a certification scheme only from a regulatory point of view	• If properly regulated, selling credits could be remunerative when the unit prices (€/t CO_2 equivalent) are higher than the unit costs incurred for practices • This situation accelerates the trend of reduced CAP support, providing farmers with alternative income to remunerate actions with positive environmental effects (Lötjönen *et al*., 2024) • Diversification of income sources (Gołasa *et al*., 2025; EC, 2025) • High market uncertainty for farmers due to price volatility (€/t CO_2 equivalent) • Need for additional incentives for certification and related transaction costs • Concern of farmers about a reduction of support from the public and private sectors	• Environmentalists • The Frugal Four (Austria, Denmark, the Netherlands, and Sweden) • Non-agricultural stakeholders	• Farmers and agricultural organisations • Environmentalists
4 – Mixed and additional (Scenarios 1 and 3)	CF is supported by both CAP pillars (which get the same amount of resources), while farmers also receive remuneration from a voluntary carbon credit market	• Double remuneration for European farmers (Paul *et al*., 2023; Günther *et al*., 2024) • Introduction of the voluntary credit market for agriculture • Need to develop outcome-based measures (McDonald *et al*., 2021) • Mixed support hardly justifiable in negotiations among European Union institutions	• Farmers and agricultural organisations	• The Frugal Four (Austria, Denmark, the Netherlands, and Sweden)
5 – Reduced CAP support and guaranteed market for carbon credits	The CAP budget decreases (e.g., from the current 32% of the Multiannual Financial Framework to 25%) and the loss of CAP support is offset by a guaranteed market for carbon credits	• Welcomed by political factions who look favourably on CAP budget reduction • The demand for credits must be constant; otherwise, there is no certainty of farmers' income stabilisation	• The Frugal Four (Austria, Denmark, the Netherlands, and Sweden) • Non-agricultural stakeholders	• Farmers and their organisations

Note: CAP, Common Agricultural Policy.

Source: Authors' elaboration based on the consulted bibliography.

5. Conclusions

As McDonald *et al.* (2021) highlighted, the environmental mitigation potential of the CAP is already considered limited by the European Court of Auditors (2021). To avoid further undermining its effectiveness and to prevent greenwashing (Scherger, Sharma, 2024), it is essential to strengthen incentives for farmers to adopt CF practices (Wongpiyabovorn *et al*., 2022; EC, 2025). This can be achieved by leveraging the flexibility offered by CAP Strategic Plans, particularly in the upcoming 2028-2034 programming period.

It should be noted that ensuring sufficient financial resources for these objectives will be a critical topic of debate among political parties, and this can be an obstacle to the pursuit of effective CF policies (Wreford *et al*., 2017). A trade-off will likely arise between the current measures under the second pillar and the potential measures dedicated to CF under the first pillar, thus necessitating an increase in policy resources. This has been mentioned in a recent study on the possible pathways of the 2028-2034 CAP Reform (Guyomard *et al*., 2024) and in the EC's Communication on its "Vision for Agriculture and Food" (EC, 2025).

It would therefore be more appropriate to reconfigure existing tools to enhance carbon storage to effectively meet environmental objectives, including the intermediate target of reducing net internal greenhouse gas emissions (net emissions) by at least 55% compared with the 1990 levels by 2030, as required by the European Climate Law (Regulation No. 2021/1119). In addition, the numerous national initiatives related to carbon storage, which are based on a variety of mechanisms (Van Hoof, 2023; Raina *et al*., 2024), could complement and stimulate the design of effective EU-wide measures, also in relation to other environmental policies. In addition, a recently published study conducted in Poland (Gołasa *et al*., 2025) has shown that when farmers are not fully aware of CF practices, there is reduced adoption of CF and, consequently, reduced effectiveness of the carbon sequestration policy itself. Further research should focus on identification of the most suitable mechanisms for CF remuneration, also building on the most effective national initiatives that received positive feedback from the farmers regarding the implementation.

Expanding CF practices to a greater number of farmers through the CAP is an appropriate path to generate significant quantitative effects in the primary sector's mitigation strategy in the EU. This would also justify the presence of specific subsidies to citizens – the policy funders – given the existence of environmental objectives and the involvement of public-interest resources, such as soil and air quality, which are public goods connected to and influenced by CF activities (Cooper *et al*., 2009; Strohschneider, 2024).

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