



European Network for
Rural Development

Sequestering carbon in soil and retaining soil carbon stores – Orientations for CAP Strategic Plans

ENRD Thematic Group on Bioeconomy and climate action in rural areas

Photo © Freepik

Soil – supporting carbon neutrality

Carbon conservation is a key priority for all sectors in order to help mitigate climate change. Rural sectors, in particular agriculture and forestry, are in a key position to be active in the removal of carbon from the atmosphere thanks to their ability to **capture and storage carbon in soils and biomass**.

In addition to mitigating climate change, improved carbon conservation and sequestration in soils contributes to healthy soil function and is necessary for maintaining the production of commodities and delivering other ecosystem services. Sustainable use and management of land and soils is at the heart of a sustainable and carbon neutral bioeconomy.

Healthy soils are a necessity

Soil organic matter consists of a range of materials from the intact tissue of plants and animals to the decomposed mixture of materials known as humus. **Soil's organic carbon content** (the amount of carbon stored in the soil) is commonly used in indicators to represent soil organic matter and the two are inherently linked in terms of their impact on soil quality, its functions and fertility.

Organic matter is an important component of soil because of its influence on soil structure and stability, water and nutrient retention, soil ecology, biodiversity, and as a source of plant nutrients. A decline in organic matter content is accompanied by a decrease in fertility and loss of structure, which together exacerbate overall soil degradation and are strongly linked to erosion, compaction and reduced soil biodiversity.

Approaches to **maintain and improve soil health** must address the interconnected factors causing soil degradation. This offers significant insight for those seeking to improve soils since success can be achieved through many different types of intervention and by employing different management practices. Solutions can be tailored to local situations to meet the needs of farmers and foresters, ensure soil health, and contribute to climate targets. In general measures to improve soil health and functions contribute to increasing soil carbon levels.

Land management, land-based emissions and soil carbon

Land management practices and land use change in agriculture and forestry are in a key position to influence the net CO₂ emissions from soils. Soil carbon levels vary between EU Member States and according to land use. Quality is generally poor on arable land – but **arable land also represents the most significant opportunity for increased carbon sequestration**. Soils under grassland and forests are a carbon sink (estimated up to 80 million tonnes of carbon per year) whereas soils under arable land are currently a source of CO₂ emissions (estimated at approximately 10-40 million tonnes of carbon per year).⁽¹⁾

The largest emissions of CO₂ from soils result from the drainage of organic soils. The most effective way to manage soil carbon in order to mitigate climate change is to preserve existing stocks in soils, especially the large stocks in peat and other soils with a high content of organic carbon.

Regional factors, such as ecosystems and weather conditions, have a significant impact on soil organic carbon, meaning that **policy decisions to improve soil organic matter need to be made at the regional level**.

(1) European Environment Agency - <https://www.eea.europa.eu/data-and-maps/indicators/soil-organic-carbon-1/assessment>



THE ROLE OF THE COMMON AGRICULTURAL POLICY (CAP)

The CAP is an important economic driver for farming decisions across the EU. It has the potential to advance soil protection in both agriculture and forestry through Member States' and land managers' implementation of its measures and associated obligations. The CAP is a key tool to consider when looking at ways to promote soil health in the EU, and to promote climate mitigation through land management. The importance of the CAP in delivering Land Use and Land Use Change (LULUCF) greenhouse gas mitigation in the EU has been noted by all Member States. Its importance is underlined given the lack of other coordinating policies at EU level focusing on soil protection.⁽²⁾

Lessons learnt from the RDPs

The 2014-2020 Rural Development Programmes (RDPs) offer an important source of funding for soil interventions, to target specific challenges and promote management changes that contribute to retaining soil carbon and promoting further sequestration. The ENRD's thematic work with stakeholders (see list of documents on page 4) has identified **opportunities for action on soil carbon with RDP interventions** and also factors limiting or influencing uptake.



Opportunities to support soil interventions within 2014-2020 RDPs

- Support for investment in low carbon technology and more efficient machinery such as direct drilling seed application to reduce soil oxidation.
- Investment in infrastructure such as covered storage for organic manures, slurries and silage.
- Supporting agri-environment-climate commitments can help land managers to adopt practices to increase the sequestration and retention of carbon in soils; e.g. cropping rotations, incorporation of crop residues to build organic matter, changes in patterns for fertiliser application, cultivation of crops with lower nutrient inputs, use of cover crops or conversion from arable land to grassland.
- The conversion to and maintenance of organic farming practices can help to rebuild soil functionality and soil organic matter.
- Cooperation support to build new supply chains, such as where carbon in wastes or residues is retained in use as a new product.
- Cooperation beyond farm or administrative boundaries to deliver landscape scale change.
- Cross cutting support for knowledge transfer via capacity building, advice and information dissemination.



Factors influencing the effectiveness and uptake of measures

- RDP measures may have limited influence on changes in farming systems given that these changes are usually more market driven.
- How restricted farmers feel given the number of prescriptions and rules that have to be followed when implementing action on the ground.
- Acceptable level of payments for activities that farmers consider costly or outside of their usual practice.
- Fear of penalties in case new measures are not implemented correctly.
- The length of the application procedure in order to receive support.
- Having the right data in order to target action, deliver advice and monitor results.
- The challenge of communicating and addressing the range of priorities (not just related to resource efficiency and soils) within an area.



Ideas for Operational Groups

EIP-Agri Operational Groups supported via RDP Cooperation Measure (M16) provide an opportunity to try out new solutions in farming and forestry. Their results may inspire novel approaches that can then be mainstreamed through other CAP interventions. This is for example happening in Ireland, where Operational Groups are used as a test-bed for diverse environmental interventions before upscaling them to national level.

Some more ideas for Operational Groups:

- Information and decision support systems.
- Farming techniques to increase soil microbial activity and biodiversity.
- Fine-tuning of composting techniques.
- Structuring of joint purchases and use of machinery.
- Selection of locally appropriate robust varieties.
- Development of innovative tillage techniques.
- Fostering the use of companion planting and cover crops.
- Introduction of new crops and variety trials.
- Soil carbon management and its economic valuation in the food chain.

(2) https://ieep.eu/uploads/articles/attachments/63232170-4433-45c8-835c-cfec96a3951b/iSQAPER%20Joining%20the%20Dots_briefing%20paper_FINAL.pdf

SUPPORT FOR SOIL CARBON RETENTION AND SEQUESTRATION UNDER THE CAP: HOW TO ACHIEVE MORE

An evaluation of the CAP looking at support for climate action⁽³⁾ noted that opportunities had been missed in the CAP programming period 2014-2020 to **contribute more coherently and with greater relevance to climate objectives**. It is noted, however, that funding under Pillar II of the CAP (2014-2020) for rural development does offer an opportunity to promote climate action through all aspects of rural bioeconomy. Analysis has shown that the existing measures could be adapted and tailored to promote further climate mitigation. Importantly, the rural development dimension means that support can go beyond land-focused interventions, including renewable energy installation, processing facilities, or support to rural communities' climate action. This enables more strategic interventions along rural value chains and territories.

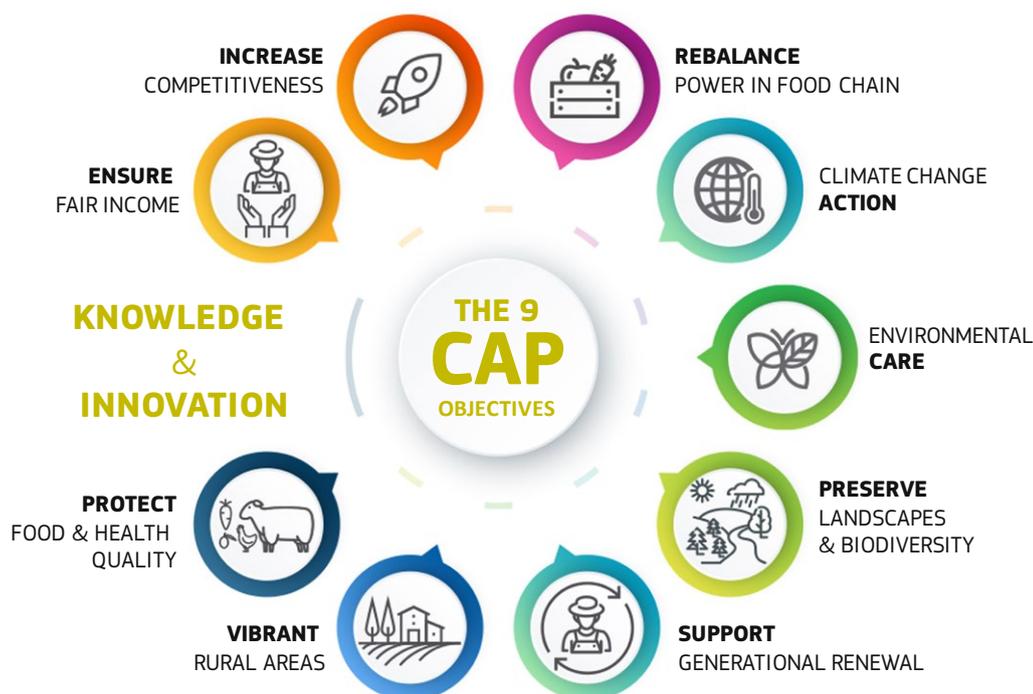
The proposal for the **CAP post 2020** sets out nine specific objectives including climate change action, environmental care and the preservation of landscapes and biodiversity. The design of a Member State's CAP Strategic Plan must consider all these objectives. Hence the Member States have the opportunity to make use of their CAP Strategic Plans to apply a holistic intervention logic and a coherent, tailored set of interventions to promote soil carbon and climate action along rural value chains, while addressing their specific needs concerning soil. To this end they can make use of all elements of the 'green architecture' of the CAP Strategic Plan: new requirements under conditionality including Good Agricultural and

Environmental Condition (GAEC); Pillar I eco-schemes; and Pillar II support such as agri-environment climate, advice, cooperation and investment interventions.

There is also an opportunity to coordinate CAP actions related to climate with wider action across a Member State's economy, by making strategic links to National Energy and Climate Plans. In order to develop a rural bioeconomy that promotes carbon conservation in soils, it is important to harness links across the economy and find ways to valorise and reward 'climate friendly' production throughout territories and value chains.

For CAP operational objectives and interventions regarding soil and climate to be effective it is critical to get stakeholder buy-in from the start of the strategic planning process. A wide range of stakeholders may be involved in the process, for example farmers, advisors, processors, marketers and retailers. Therefore, when developing programmes of action the needs of stakeholders should be considered including:

- Preferred means of engagement and timing.
- Specific interests, fears and uncertainties.
- Their current knowledge of the issues and where specialist knowledge may be needed.
- Preferences and opportunities for cooperation.



© European Union

(3) Effective performance of tools for climate action policy - meta-review of Common Agricultural Policy (CAP) mainstreaming, European Commission, Directorate-General for Climate Action, 2018 - https://ec.europa.eu/clima/sites/clima/files/forests/lulucf/docs/cap_mainstreaming_en.pdf

POSSIBILITIES FOR SOIL BASED CLIMATE ACTION IN CAP INTERVENTIONS

The following table⁽⁴⁾ provides a summary of the sorts of activities that might be promoted on farm, under operational objectives and across GEAC, eco-schemes and Pillar II. These activities are either linked to, or directly contribute to soil carbon conservation or sequestration. At the same time they contribute to other environmental functions of the soil, through improved soil health and structure.

It should be noted that applying new management techniques requires upskilling and education. Hence it is important to link on-farm activities to the provision of relevant advisory services, information and knowledge exchanges for example by demonstration farms and peer to peer learning.

Cluster	Action
Crop management	Extend the perennial phase of crop rotations
	Reduced tillage*
	Zero tillage*
	Leaving crop residues on the soil surface
	Ceasing to burn crop residues and vegetation
	Use cover/catch crops
	Biochar applied to soil
	Maintain soil pH at suitable levels for crop/grass production
	Delay applying mineral N to a crop that has had slurry applied
	Reduce soil compaction
Land Use	Conversion of arable land to grassland to sequester carbon in the soil
	Afforestation of degraded lands
Grazing system	Retention of permanent pasture (i.e. no ploughing up of established pasture)
	Changing grazing patterns
	Rejuvenating pastures
	Integrated pasture cropping
Manure management	Deep subsoil manuring
	Anaerobic digestion (to reduce GHG emissions during manure storage)
	Covering slurry and farm-yard manure
Actions to reduce emissions from agricultural use of organic soils	Wetland/peatland conservation/restoration
	Extensification of agricultural land-use in wetlands
Above-ground living biomass management (landscape features, agro-forestry, forestry)	Agroforestry
	Woodland planting
	Preventing deforestation and removal of farmland trees of existing woodland, hedgerows, woody buffer strips and trees on agricultural land

* In line with the principles of regenerative agriculture, reduced tillage should be combined with Integrated Pest Management or biological pest management approaches.

RELEVANT ENRD PUBLICATIONS AND FURTHER READING

- EU Rural Review 25 – Resource efficiency: https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/publi-enrd-rr-25-2018-en.pdf
- ENRD Factsheet – FOCUS AREA 5E: Carbon conservation / sequestration, Rural Development Programmes 2014-2020: Key facts & figures: https://enrd.ec.europa.eu/sites/enrd/files/focus-area-summary_5e.pdf
- ENRD Thematic Group on Resource efficient rural economy – Background paper – October 2016: https://enrd.ec.europa.eu/sites/enrd/files/tg1_resource-efficiency_background-paper.pdf
- ENRD Thematic Group on Resource efficient rural economy – Improving the resource efficient management of soils and water: https://enrd.ec.europa.eu/sites/enrd/files/tg1_resource-efficiency_brief-themes.pdf
- Rural Development Programmes 2014-2020: Key facts & figures FOCUS AREA 4C: Preventing soil erosion and improving soil management: https://enrd.ec.europa.eu/sites/enrd/files/focus-area-summary_4c.pdf
- Thematic Group on resource efficient rural economy – Final report: https://enrd.ec.europa.eu/sites/enrd/files/tg-resource-efficiency_final-report.pdf
- Soil organic carbon, European Environment Agency: <https://www.eea.europa.eu/data-and-maps/indicators/soil-organic-carbon-1/assessment>
- Soil organic matter management across the EU – best practices, constraints and trade-offs – European Commission, 2011: https://ec.europa.eu/environment/soil/pdf/som/exec_summary.pdf
- Inventory and Assessment of Soil Protection Policy Instruments in EU Member States – European Commission (2017): https://ec.europa.eu/environment/soil/pdf/Soil_inventory_report.pdf
- Why do research and innovation on soils matter? – Fact sheet, European Commission https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/factsheet-agri-soils_en.pdf
- Getting to the roots of sustainable land management – IEEP, December 2019 <https://ieep.eu/publications/policy-brief-getting-to-the-roots-of-sustainable-land-management>

(4) Adapted from Effective performance of tools for climate action policy - meta-review of Common Agricultural Policy (CAP) mainstreaming, European Commission, Directorate-General for Climate Action, 2018 - https://ec.europa.eu/clima/sites/clima/files/forests/lulucf/docs/cap_mainstreaming_en.pdf