REPORT

Soil carbon and regenerative land management: developing a holistic agricultural policy

Following the High Level Group 17th meeting on 14 May 2025

Summary and main outcome of the HLG meeting

During its 17th meeting, chaired by Phil Hogan, the independent tripartite High Level Group on Agri-food System Innovation continued its role as a laboratory for EU policy innovation in this specific realm.

This role was given to these High Level groups by the Competitiveness Council Presidency in 2011[1], aiming at inclusive policy innovation by thinking "outside the box". Members are a diverse group of experts from the public, private, and academic sector, brainstorming together according to the Socratic dialogue method, in order to reach operable ideas.[2]

Key recommendations:

- Soil and water health must be elevated as a priority in EU agriculture policies, not only for its critical environmental benefits but also as a foundation for the long-term food security and agri-food systems' transformation.
- A holistic approach should be adopted to agri-food policymaking by integrating regenerative agriculture, regenerative hydrology, carbon farming and biomass, and nutrient cycling into a coherent policy framework. Future instruments must reflect the interdependence of the system to deliver system-wide productivity, profitability and sustainability, strengthen ecosystem resilience and accelerate the transition to a circular climate-smart bioeconomy by rapid adaptation of the newest technologies and practices.

[1] Council of the EU, 5-6 December 2011, Presidency Note.
[2] Members participate in their personal capacity. All recommendations for action and all ideas for further consideration have not always been agreed on by all members, but each advice is based on a very wide consensus. The final version is written under responsibility of the chairperson and the executive director. More information is available at: https://www.highlevelgroup.eu/

- CAP incentives should be redesigned to reflect the economic realities faced by farmers, particularly smallholders and those operating on degraded land. Furthermore, public subsidies must be aligned to reduce financial risks and provide transitional support, ensuring that climate-smart practices are both profitable and scalable.

- The EU should create the framework conditions for the deployment of enabling technologies, such as UPP and other digital tools, that can accelerate the adoption of sustainable farming practices and to achieve ecological goals, such as carbon capture, storage and use. This requires strong safeguards on data ownership, farmer agency and inclusive access, as well as investments in digital literacy, participatory design and capacity-building.

1. Soil at the centre of the EU green transition

The transformation of the EU agri-food system is necessary to achieve Europe's green transition objectives.

At the core of this transformation lies soil health, a foundational element often overlooked by EU policymakers. Despite its central role in food production, climate mitigation and ecosystem resilience, an estimated 60–70% of soils in the EU are in rather degraded conditions due to outdated, intensive agricultural practices, harmful for the ecosystem. Restoring soil health must then be recognised as a priority, not only from an environmental point of view but also for ensuring long-term food security and delivering on EU climate commitments.

Current EU frameworks often lack a holistic perspective, further hindering, as already highlighted in several recent policy documents[3], the effective implementation of sustainable goals. Indeed, agriculture systems do not operate in isolation; they are inherently linked to water cycles, energy use, and ecosystem services, and so on - interdependencies well captured by the Water-Energy-Food-Ecosystems (WEFE) Nexus[4]. This, in turn, calls for a paradigm shift in EU policymaking, moving beyond siloed approaches and toward holistic frameworks that recognise the mutual reinforcement between regenerative agriculture, regenerative hydrology, carbon farming and nutrient cycling - all essential components of a One Health vision[5] - as well as the essential role that farmers play in providing ecosystem services.

[3] HLG Biosphere Economy Innovation, Discussion Paper on «Importance of Soil Structure and Soil Biodiversity for Soil Health and Sustainable Agriculture" by Dr Ladislav Miko", 2023; Agrideès, A land-based bioeconomy, enabling farming resilience, 2025; OECD, Policies for the Future of Farming and Food in the European Union, 2023.
[4] HLG Agri-food System Innovation, Report *Towards regenerative landscapes: embedding water resilience in EU biosphere strategies*, 2025. Report of the Strategic Dialogue on Agriculture, 2024.
[5] HLG Blueprint, *What comes after the European Green Deal*, 2024.

In light of this systemic perspective, EU policymakers should then include in the upcoming CAP reform, Biodiversity Strategy, Horizon Europe's missions and in the LIFE Programme, policy targets aimed at ensuring that public funding actively supports farmers in transitioning to sustainable practices underpinning agri-food system transformation. This includes also enhancing knowledge-sharing, investing in innovation and fostering public-private cooperation to create a more resilient and climate-smart food system, with healthy soils as its foundation.

2. The Contribution of Regenerative Agriculture and Regenerative Hydrology to Soil Health

Regenerative agriculture and regenerative hydrology represent two transformative approaches that can restore degraded soils, enhance ecosystem functionality and support the EU's agri-food system in aligning with the objectives of the Green Deal. These practices work synergistically to rebuild soil organic matter, improve water retention and reduce erosion[6], while increasing biodiversity and sequestering carbon. Techniques such as agroforestry, holistic pasture management, natural sequence farming, and the use of legumes, cover crops, and trees foster highly diverse systems that promote soil fertility and structural stability. Furthermore, complementary methods like crop rotation, rainwater harvesting, and organic fertilisation reduce reliance on synthetic inputs and reinforce the multifunctional value of soil as a public good.

At the landscape level, regenerative hydrology further supports this transition by restoring the natural water cycle through interventions such as wetland rehabilitation, rehydration techniques and green water management. These strategies improve how soils receive, retain, recharge and release water, thus enhancing drought resilience, reducing flood risks, and contributing to land restoration goals and multiple Sustainable Development Goals (SDGs)[7]. In particular, strengthening the "green water" cycle , namely the soil's capacity to absorb rainfall and return moisture to the atmosphere, is essential for maintaining microclimates, supporting vegetation growth and ensuring the long-term health of agricultural systems.

Thus, together regenerative agriculture and regenerative hydrology work in synergy to restore soil structure, enhance organic matter content and improve water retention capacity, creating the physical conditions necessary for long-term carbon sequestration in soils. From a farmer's perspective, these practices offer the potential for reduced input costs, improved yields over time and access to new market opportunities, aligned with sustainability and consumer demand.

[6] HLG Biosphere Economy Innovation, Discussion Paper on «Carbon Farming and Transition to Sustainable Food Systems in Europe » by Kaj Granholm, 2022.
[7] HLG Biosphere Economy Innovation, Report, 2022.

However, the transition to regenerative systems is not without challenges. Upfront costs, limited access to knowledge and advisory services, and uncertainties in market-based rewards for ecosystem services can act as deterrents. Therefore, stronger and more tailored support from the EU is essential to ensure the scalability and fairness of sustainable farming practices, including financial incentives, enabling legislation and knowledge-sharing platforms, that could empower farmers and promote equitable outcomes across the agri-food system.

3. Carbon Farming and Soil Carbon Sequestration: Building a Climate-Smart Rural Economy

Much like regenerative agriculture and regenerative hydrology, soil carbon capture plays a central role in Europe's climate strategy and is fundamental in transforming agri-food systems. As one of the largest terrestrial carbon sinks, healthy soils sequester atmospheric CO_2 through biological processes such as plant-root interactions, microbial activity and organic matter accumulation[8].

This process underpins the foundation of carbon farming, a range of agricultural practices aimed at enhancing soil organic carbon while maintaining productive land use[9]. Recognising this potential, the European Commission has already taken relevant steps through the *Sustainable Carbon Cycles Communication* (COM(2021)800) and the *Carbon Removal Certification Framework* (CRCF Regulation, EU/2024/3012) to develop regulatory and financial instruments that support and reward verifiable carbon removals in agriculture. Nonetheless, significant challenges persist, particularly concerning the robustness of monitoring, reporting, and verification (MRV) systems, as well as the socio-economic viability of implementing carbon farming at scale across diverse agricultural contexts. To this end, well-designed EU policies with strong scientific foundation that reflect local realities, account for ecological trade-offs and balance long-term risks with potential co-benefits should be formulated.

Moreover, by offering a dual function, i.e. cultivating both food and carbon on the same land, carbon farming offers an additional revenue for farmers, diversifying their incomes while enhancing resilience to climate and market volatility. In this sense, it opens the door to a new rural economy, one that values ecosystem services—such as carbon sequestration, water regulation, and biodiversity restoration—on par with food production and far from creating a conflicting perspective between productivity and sustainability.

Nonetheless, realising this sustainable potential depends also on addressing structural barriers. Many farmers continue to operate with outdated tools, limited market access and insufficient advisory

[8] HLG Biosphere Economy Innovation, Discussion Paper on «Importance of Soil Structure and Soil Biodiversity for Soil Health and Sustainable Agriculture" by Dr Ladislav Miko", 2023.
[9] https://www.cleanenergywire.org/factsheets/carbon-farming-explained-pros-cons-and-eus-plans

services and do not see the benefits of carbon farming. Without clear and fair incentives, carbon farming remains financially inaccessible for many, particularly smallholders or those managing degraded lands. To shift this dynamic, profitability could (initially) precede sustainability: climate-smart practices will only be adopted at scale if they offer tangible economic returns. Public subsidies, such as payments for ecosystem services and results-based schemes under the Common Agricultural Policy (CAP), must be aligned to reduce financial risks and provide transitional support.

At the same time, new technologies – such as the UPP technology[10] - can accelerate adoption if implemented with attention to data governance and farmer's overview. Challenges such as data ownership, technological literacy and farmer resistance must be met with transparency, participatory design and capacity building. Moreover, public-private collaboration will be critical in developing scalable models and enabling innovation across the value chain. Cross-sector dialogue, mutual learning, and inclusive legislative frameworks will ensure that carbon farming evolves not as a niche practice, but as a cornerstone of a resilient and climate-aligned agri-food system.

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[10] A lead example is Defugo's Universal Processing Plants (UPPs) which are modular, zero-waste bioindustrial hubs that simultaneously address food security, clean energy access, circular economy implementation, and climate mitigation. Each UPP integrates biomass processing, sustainable agriculture support, renewable fuel production (e.g. biodiesel, SAF, hydrogen), nutrient recovery, and carbon sequestration through biochar. These plants replace fragmented legacy infrastructure with regionally embedded circular systems that close ecological loops.