ClieNFarms Policy Brief #1: How can EU farms contribute to Climate Neutrality?

Alba Saez, IFOAM Organics Europe; Matthias Kuhnert, University of Aberdeen; Katja Klumpp, INRAE; Lin Bautze, FIBL; Sabine Reinecke, FIBL; Peter Fröhlich, AgriCircle; Deirdre Hennessy, UCC; Daniel Zimmer, Climate KIC; Jacques-Eric Bergez, INRAE; Guy Ziv, University of Leeds.

- ✓ Only a holistic approach to farming, i.e., considerate of all farm components and their interactions within and beyond the farm gate, ensures the overall integrity of the farm-to-food system and should be prioritised in policymaking.
- ✓ Policy and innovations in farming practices must go beyond 'neutrality in GHG budgets' and equally strengthen the resilience of farms by addressing biodiversity loss, nutrient and water cycling, and soil health.
- ✓ Policy support should incentivise the adoption of holistic approaches to farming to ensure long-term food security.

What is the problem?

In the EU, GHG emissions from agriculture have decreased by 7% between 2005 and 2023[i] (see Figure 1). This is insufficient to achieve a 55% reduction by 2030 or climate neutrality by 2050, as established in the European Climate Law[i]. Agriculture contributes to climate change not only through greenhouse gas emissions (GHG) and changes in soil organic carbon stocks, but also through modification of biogeochemical (e.g., P and N cycles) and bio-geophysical processes (e.g. albedo effects), land system change, loss of biosphere integrity, freshwater change and other types of environmental pollution (e.g., soil and air). The relationship between agriculture and the environment is reciprocal; while agriculture is a major driver of the Earth system exceeding planetary boundaries[ii], it is also crucial for maintaining biodiversity, soil health, water resources, food security, food sovereignty, and livelihoods; namely, it is part of the solution.

The EU Green Deal (EGD) aims to support the transition to a climate neutral EU with a strategy designed to consider GHG emissions and beyond, in what the Joint Research Centre (JRC) has described as a holistic and cross-sectoral approach[iii]. However, there are currently no direct, legally binding obligations imposed on EU farmers to reduce agricultural GHG emissions, only voluntary mechanisms. Moreover, the achievement of some Farm to Fork (F2F) targets by 2030, such as a 50% reduction in nutrient losses and in the use of more hazardous pesticides or a 25% of total farmland under organic farming, remain challenging, highlighting the need for urgent measures[iii].

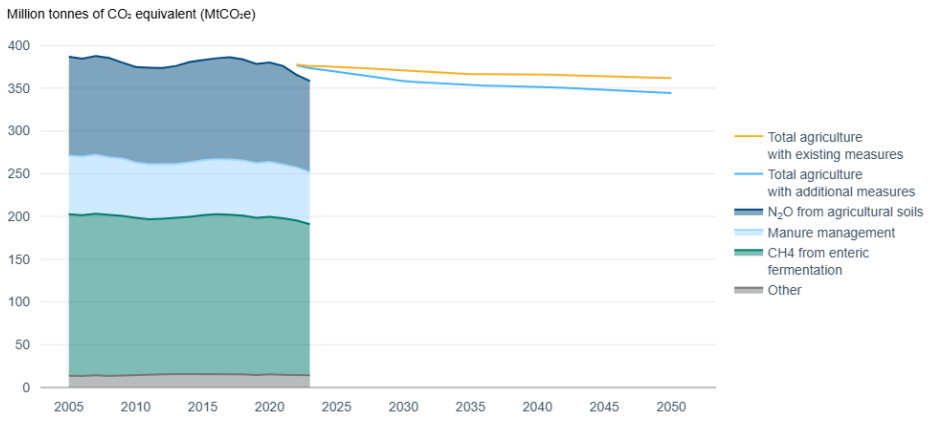

Figure 1 – EU agriculture emissions by source and projected emissions. Source: EEA.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101036822

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the European Commission can be held responsible for them.

Aim of the Policy Brief

Against this backdrop, the Innovation Action project **ClieNFarms** supports the EGD by co-developing and scaling up *systemic* and locally relevant farming solutions that foster climate neutrality and climate resilience **at the farm level** across Europe. The ClieNFarms project brings together data from real farmers across the EU, results from climate-model comparisons and stakeholder engagements across the upstream part of the food supply chain. Project partners, including researchers, farmers and other experts, engaged in interdisciplinary exchanges and workshops to define climate neutrality and determine how policymakers could support farmers in their transition. This policy brief is the result of these exchanges.

Highlights of the Interdisciplinary Exchange

ClieNFarms is proposing a climate neutrality framework based on a holistic approach to farming with a strong focus on maintaining and strengthening farms' resilience (see Figure 2).

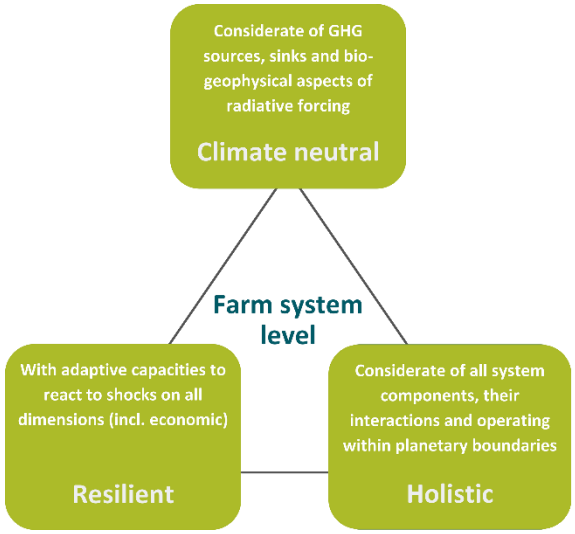

Figure 2 - Climate farming in ClieNFarms follows a holistic approach to climate neutrality with a strong focus on climate resilience. These three main elements cannot be separated from each other in policy implementation, climate calculations and rewarding mechanisms.

- **Terminology around climate neutrality**

The European Climate Law's legally binding target of net zero greenhouse gas emissions by 2050, when applied at the farm level, suggests a simple 'budgeting' approach to climate neutrality based on the reduction of greenhouse gas (GHG) emissions and increase of organic carbon stocks broadly limited to the agricultural production side. This approach risks falling short of capturing all relevant bio-geophysical processes, i.e., changes in surface albedo, reduction in sensible heat flux and infrared radiation, behind the integrity of terrestrial ecosystems. When looking at climate mitigation, policy and practice often overlook how specific land uses (changes), through bio-geophysical processes like evapotranspiration or albedo, interfere with radiative forcing beyond GHGs. Therefore, in ClieNFarms, we understand **climate neutrality** as a balance between GHG emissions, removals and radiative effects of terrestrial ecosystems (see Figure 3 for a summary of the terms commonly used when talking about neutrality), and we look at how solutions at the farm level can be implemented and incentivized.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101036822

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the European Commission can be held responsible for them.

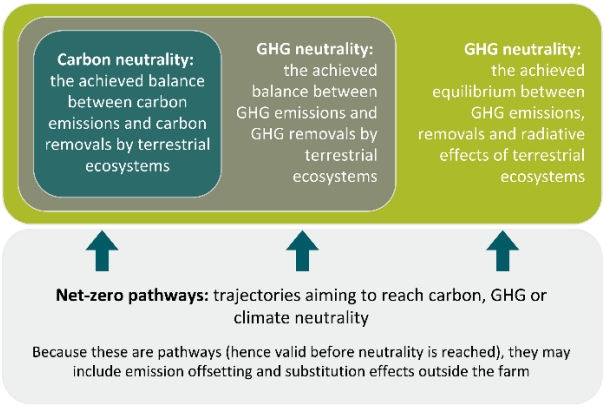

Figure 3 - Definition of seemingly interchangeable terms: carbon neutrality, GHG neutrality, net-zero pathways and climate neutrality.

- **A holistic approach to climate neutrality**

Because of the intimate interlinkages within and across ecosystems and the fact that non-sustainable agriculture practices in one place may directly impact how climate change is experienced elsewhere, the impact of farming practices needs to be assessed with a holistic approach, as described in Figure 4. ClieNFarms uses a **holistic approach** to find systemic and local solutions, as it considers the following variables besides GHG emission reduction and carbon sequestration in different types of farming systems:

- The interactions between GHG emission reduction, C removals and bio-geophysical effects;
- Integral environmental sustainability: changes in the farm that proactively avoid negative environmental consequences on biodiversity, soil health, nutrient or water cycling;
- Low carbon energy production and consumption;
- Other approaches, including governance, circular organisation, etc.

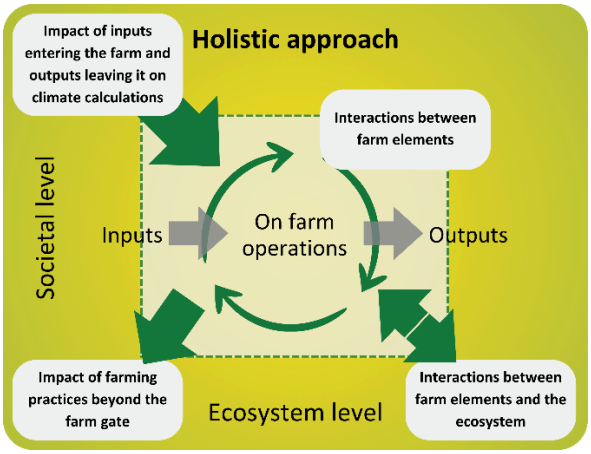

Figure 4 - The holistic approach proposed by ClieNFarms. It includes elements to consider when assessing the impact of changes in agricultural practices and the farmers' reward for adopting them.

Climate neutrality, as proposed in the Paris Agreement, is the final global equilibrium we want to reach by 2050. This involves urgently deploying resources to achieve net-zero greenhouse gas emissions worldwide by the latter half of the century through collective and holistic efforts[iv]. Addressing carbon leakages on the way to net-zero is crucial (Figure 3), as they risk increasing global emissions.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101036822

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the European Commission can be held responsible for them.

- **Focus on climate resilience in agriculture**

Addressing all the aforementioned elements strengthens the resilience of farming systems, which is a priority for farmers, and so should it be for policymakers. There cannot be long-term food security without preserving the natural diversity and the farm profitability of the landscape that farming systems are embedded in. Figure 5 shows the 4 elements to be safeguarded to strengthen the system's capacity to recover from shocks, which is where adaptation and resilience intersect.

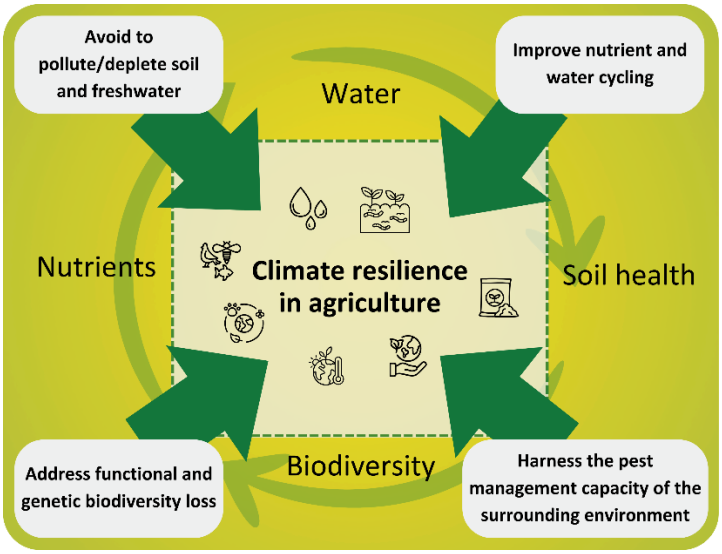

Figure 5 - Diagram of climate resilience in agriculture, including the 4 pillars (nutrient cycle, soil health, water cycle and biodiversity) that, when safeguarded, allow the farming system to cope with climate-related shocks.

The claim that we must intensify food production to feed a growing population is misleading. The world already produces enough food to feed the global population, and even a growing one, as reported by the JRC, IPCC, FAO, etc. The FAO states that global hunger is a problem of systemic inequalities, including unequal distribution, lack of access and climate change impacts on food systems[v]. Current agrifood systems rely on unsustainable methods like carbon-intensive imports and an unhealthy dependence on chemical fertilizers and pesticides, undermining net-zero goals. In the EU, 70% of agricultural emissions come from animal farming, with 40% of global cropland used for feed crops, while meat consumption exceeds human and planetary health recommendations. Many reports stress that, to feed a growing population on a planet with limited resources, a systemic approach to farming that also looks at the whole supply chain, including food waste and diets, is needed (JRC[iii], ECNO[vi]).

References:

[i] European Environment Agency. "Greenhouse gas emissions from agriculture." Published 31 Oct 2024. Accessed 5 Feb 2025. https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-from-agriculture

[ii] Campbell, B. M., D. J. Beare, E. M. Bennett, J. M. Hall-Spencer, J. S. I. Ingram, F. Jaramillo, R. Ortiz, N. Ramankutty, J. A. Sayer, and D. Shindell. 2017. *Agriculture production as a major driver of the Earth system exceeding planetary boundaries.* Ecology and Society 22 (4):8. https://doi.org/10.5751/ES-09595-220408

[iii] European Commission: Joint Research Centre, Marelli, L., Trane, M., Barbero Vignola, G., Gastaldi, C. et al. (2025) *Delivering the EU Green Deal – Progress towards targets*, Publications Office of the European Union. https://data.europa.eu/doi/10.2760/3105205

[iv] Net Zero Initiative. (2022). *10 principles for an ambitious corporate climate strategy.* Net Zero Initiative. https://www.net-zero-initiative.com/en

[v] FAO, IFAD, UNICEF, WFP and WHO. (2024) *The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms.* Rome. https://doi.org/10.4060/cd1254en

[vi] European Climate Neutrality Observatory (2024). *Flagship report: State of EU progress to climate neutrality.* European Climate Neutrality Observatory. https://climateobservatory.eu/report/2024-report-state-eu-progress-climate-neutrality

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101036822

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the European Commission can be held responsible for them.