

Rough estimate of the climate change mitigation potential of the CAP Strategic Plans (EU-18) over the 2023-2027 period

Executive summary

November 2024

This document represents a preliminary version of the Rough Estimate of the Climate Change Mitigation Potential of the CAP Strategic Plans over the 2023-2027 Period. It is intended to provide an accessible summary of the analysed EU-18 findings to diverse stakeholders. Please note, however, that this document may still contain some inaccuracies or omissions as the final proofreading will be applied to the version encompassing the full scope of the EU-27. According to the current planning, this final version will be published in the EU CAP Network publications database in Quarter 1, 2025, and will serve as the official reference text.



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List of acronyms

CO _{2e}	Carbon dioxide equivalent
CAP	Common Agricultural Policy
CIS	Coupled Income Support
CRF	Common Reporting Format
CSP	CAP Strategic Plans
EEA	European Environment Agency
ESR	Effort Sharing Regulation (EU) 2018/842
EU	European Union
EU-18	18 Member States covered
GAEC	Good Agricultural and Environmental Conditions
GHG	Greenhouse gas
LULUCF	Land Use, Land Use Change and Forestry



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Questions and suggestions regarding the content of the publication can be addressed to the European Evaluation Helpdesk for the CAP at evaluation@eucapnetwork.eu



1 Background

According to data reported by Member States of the European Union (EU) under the EU Governance Regulation (EU) 2018/1999¹, in 2022 the agricultural sector is estimated to have emitted 366 million tonnes of carbon dioxide equivalent (CO₂e), accounting for 11% of the estimated EU's total greenhouse gas (GHG) emissions, with two thirds emitted by the livestock sector (enteric fermentation and manure management)². Land Use, Land Use Change and Forestry (LULUCF) sector activities are estimated to have removed 236 million tonnes net of CO₂e from the atmosphere in 2022, equal to 7% of the EU's annual estimated GHG emissions. Cropland and grassland are sources of LULUCF emissions at EU level, estimated at 41 million tonnes of CO₂e, accounting for 1.2% of EU's annual estimated GHG emissions.

However, the Annual European Union greenhouse gas inventory 1990–2021 and inventory report 2023³ points to important uncertainties in the estimation of GHG emissions at EU level. In addition, it is not clear the extent to which the granularity of the estimation is considering the implementation of practices and investments at farm level. So, there is a need to further analyse and better quantify the contribution of certain agricultural practices to climate mitigation.

To enhance the contribution of the EU farming sector to the EU climate objectives, multiple Common Agricultural Policy Strategic Plan (CSP) instruments were designed to increase the carbon sinks and to reduce emission sources. In addition, in the CSPs, 32% of the total Common Agricultural Policy (CAP) funding is aimed to be devoted to delivering benefits for the climate, water, soil, air, biodiversity, animal welfare, and encouraging practices beyond the mandatory conditionality.

This study examines the CSPs drawn up as part of the CAP 2023-2027 programming, and it analyses their potential contribution to reducing GHG emissions, enhancing carbon removals, and conserving existing carbon stocks. It establishes, for the first time, the link between CSP planned instruments and their mitigation potential at EU

¹ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (Text with EEA relevance.), OJ L 328, p. 1–77, ELI: <http://data.europa.eu/eli/reg/2018/1999/oj>.

² European Environment Agency data available on:

<https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-from-agriculture>

³ European Environment Agency, *Annual European Union greenhouse gas inventory 1990–2021 and inventory report 2023 – Submission to the UNFCCC Secretariat, 2023*, https://www.eea.europa.eu/ds_resolveuid/a9f7f010d2d348488e4345e7fdb3709e.



level, representing a starting point for the development of a further refined methodology using Member State data and the improvement in their GHG emissions and removals inventories. The study does not account for the contribution of other policies and measures implemented in Member States beyond the CSPs and their mitigation potential.

2 Methodology

The study establishes the link between CSP instruments (i.e. Good Agricultural and Environmental Conditions (GAECs) and CAP interventions⁴) and their GHG emission mitigation or carbon protection potential in 18 Member States (corresponding to 19 CSPs⁵). These 18 Member States (EU-18) collectively cover 92% of the European utilised agricultural area⁶ and encompass around 95% of EU GHG emissions from agriculture⁷.

The methodology applied in this study relies on programming data extracted from the CSPs as approved by the European Commission in December 2022, on rough estimates of expected implementation levels, and on average emission and removal coefficients of farming practices mainly derived from meta-reviews of scientific papers⁸.

⁴ The study covers different instruments of Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) 1305/2013 and (EU) 1307/2013, OJ L 435, pp. 1–186, ELI: <http://data.europa.eu/eli/reg/2021/2115/oj>:

- GAECs (Article 13),
- Schemes aimed at promoting climate, environmental, and animal welfare objectives (hereinafter referred to as Eco-schemes), covered under Article 31,
- Coupled Income Support (CIS) targeting protein crops (Article 33(c)),
- Environmental, climate-related, and other management commitments (hereinafter referred to as ENVCLIM), covered under Article 70,
- Investments (hereinafter referred to as INVEST), delineated in Article 73.

⁵ There are two CSPs in Belgium, one for Flanders and one for Wallonia.

⁶ Source: Eurostat [ef_lus_main](#), year 2020

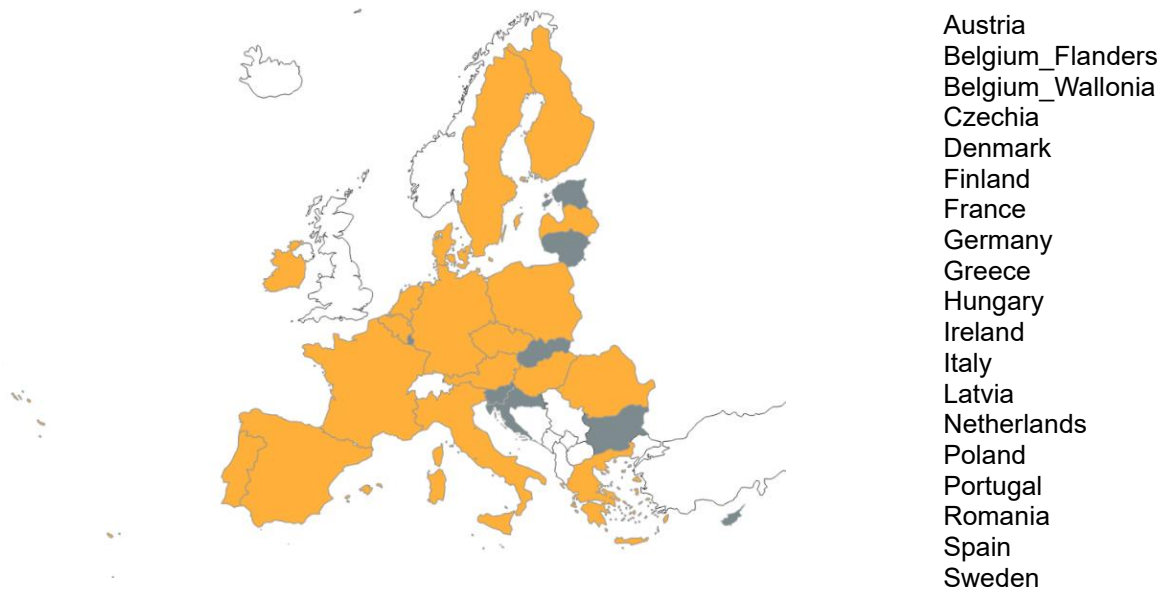
⁷ See footnote 2

⁸ iMAP (Integrated Modelling platform for Agro-economic and resource Policy analysis):

- Guerrero, I., Bielza Diaz-Caneja, M., Angileri, V., Assouline, M., Bosco, S., Catarino, R., Chen, M., Koeble, R., Lindner, S., Makowski, D., Montero Castaño, A., Perez-Soba Aguilar, M., Schievano, A., Tamburini, G., Terres, J. and Rega, C., *Quantifying the Impact of Farming Practices on Environment and Climate*, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/20814, <https://publications.jrc.ec.europa.eu/repository/handle/JRC137826>.
- Schievano, A., Perez-Soba Aguilar, M., Bosco, S., Montero Castaño, A., Catarino, R., Chen, M., Tamburini, G., Landoni, B., Mantegazza, O., Guerrero, I., Bielza Diaz-Caneja, M., Assouline, M., Koeble, R., Dentener, F., Van Der Velde, M., Rega, C., Furlan, A., Paracchini, M.L., Weiss, F., Angileri, V., Terres, J. and Makowski, D., 'iMAP FP dataset – An evidence library of the effects of



Figure 1 – 19 CSPs included in the study



Using these sources, the methodology is based on the following steps:

1. at CSP level, identification of the interventions and GAECs that have the potential to positively contribute to GHG emission reduction and enhance carbon removal, or to protect existing carbon sinks,
2. association of each intervention and GAEC with farming practices,
3. estimation of the area (in terms of hectares⁹) expected to be covered by a farming practice,
4. estimation of the mitigation or protection potential contribution of each intervention and GAEC, by multiplying the estimated area (or other unit of measurement) of each farming practice by its mitigation/removal coefficient value, before aggregating them subsequently at the intervention/GAEC, CSP and EU-18 levels.

Farming Practices on the environment and the climate, European Commission, Joint Research Centre (JRC) [Dataset] (created 8 November 2023, last updated on 25 June 2024). doi: [10.2905/4e3c371a-be72-4ea0-aa0b-45f8cdda2064](https://doi.org/10.2905/4e3c371a-be72-4ea0-aa0b-45f8cdda2064).

⁹ Other units of measurement can also be used, such as livestock units, or megawatts.



The methodology employed is based on a series of assumptions and simplifications necessary at various stages of the analysis. The calculation provides an order of magnitude for the potential contribution of the CAP instruments. Moreover, the GAECs and CAP interventions are treated differently. For CAP interventions, the estimated potential contribution encompasses all the areas where farming supported practices are expected to be implemented through the different types of intervention, whereas, for GAECs, the study aims to estimate only the potential contribution of the additional areas where farming practices will be implemented to comply with the standards in the new programming period, compared to the previous programming period. With this approach, the potential contribution estimated for GAECs might result underrated.

Consequently, results should be interpreted with caution and only as an indicative order of magnitude. Further refinements to the methodology, such as the use of local coefficients and data on the actual uptake of the interventions, will improve the accuracy of the estimates. Furthermore, the estimated potential contribution encompasses all the areas where farming practices supported through various types of intervention are planned. This can include areas where these practices would be adopted even without financial support or were already supported under the previous CAP programming period.

3 Main results

Estimated potential contributions of the CSP instruments on GHG mitigation and carbon removal are differentiated from those on carbon protection, and results for both categories are kept separate.

3.1 Estimated mitigation/removal potential contribution

The analysis indicates a potential positive contribution of the 19 CSPs to GHG emission reduction and enhanced removal of 31 million tonnes of CO_{2e} per year.

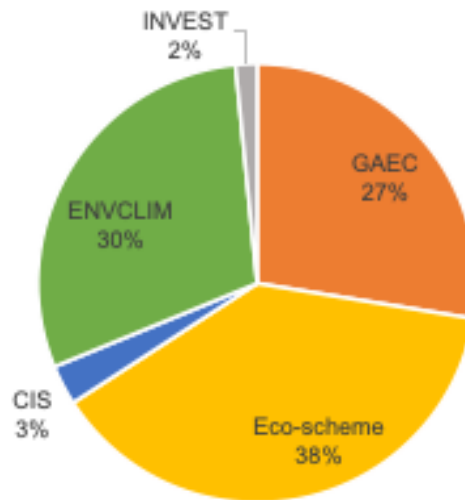
This estimated contribution represents a potential effect on climate change mitigation. However, it is currently associated with a range of uncertainties due to the numerous assumptions made. In particular, the extent to which the yearly positive contribution can be cumulated until 2027 strongly depends on the additionality of actual yearly uptake of practices by farmers.

In terms of farming practices, crop rotation or diversification, expansion of cover crops, and conversion to organic farming contribute 78% of the estimated mitigation potential.

In terms of instruments, Eco-schemes account for 38% of the estimated mitigation potential, ENVCLIM interventions 30%, and GAEC compliance 27% (notably GAEC 6 – Soil Cover and GAEC 7 – Crop Rotation on arable land).



Figure 2 - Estimated mitigation potential per GAEC and type of intervention (%)



Source: 19 CSPs, Mapping and analysis of CAP Strategic Plans, iMAP and Ricardo.

3.1.1 Contextualisation of the estimated potential

To contextualise the contribution of the CSPs, estimates are aggregated according to the categories of the United Nations Framework Convention on Climate Change (UNFCCC) Common Reporting Format (CRF) developed for national inventories of GHG emissions and removals. Although the correspondence is not always straightforward because the methodology employed to estimate the CSPs potential mitigation contribution deviates from the Intergovernmental Panel on Climate Change inventory methodologies used by EU Member States under the EU Governance Regulation (EU) 2018/1999, this step makes it possible to put CSP estimated potential contribution into context with regard to current emissions and removals in the EU-18.

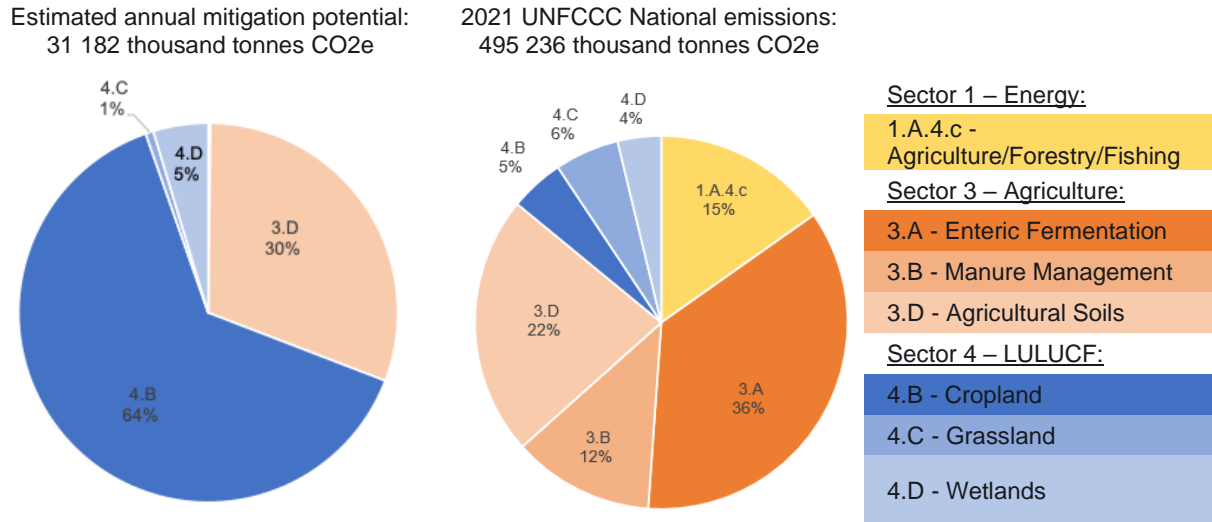
The 31 million tonnes of yearly estimated potential contribution of the 19 CSPs are distributed between **9 million tonnes of GHG emission reduction and 22 million tonnes of enhanced carbon sequestration per year**. These estimated potential effects account respectively for **2.6% of the emissions reported under CRF sector 3 – Agriculture in 2021 for the EU-18, and 10.9% of the net removals reported under CRF Sector 4 – LULUCF¹⁰**.

At a more disaggregated level, the estimations compared to 2021 emissions reported in the EU-18 covered are shown in the graphs below.

¹⁰ See footnote 2



Figure 3 – Comparison of the distribution per CRF category (excluding category 4.A – Forestry) of the CSPs estimated mitigation potential contribution (left) and the national emissions reported to the UNFCCC (right)¹¹



Source: 19 CSPs, Mapping and analysis of CAP Strategic Plans, iMAP and Ricardo, European Environment Agency (EEA).

When considering the analysed 19 CSPs:

- Two thirds (64%) of the estimated mitigation potential are associated with the CRF category 4.B – Cropland, which corresponds to storage of carbon in cropland soil.
- The second-largest estimated potential effect is a reduction of non-CO₂ emissions from agricultural soils and wetlands (CRF categories 3.D - Agricultural Soils and 4.D – Wetlands, accounting for 30% and 5% respectively).
- The estimated potential contribution of CSPs associated with the GHG emissions from CRF categories 3.A - Enteric Fermentation and 3.B - Manure Management is expected to be low. However, this study is not assessing other policies and measures programmed by Member States to reduce emissions from livestock, representing a significant share of non-CO₂ emissions at EU level.

¹¹ Emissions from energy consumption in the agriculture, fisheries and forestry sector (CRF category 1.A.4.C) are also considered, as they are directly related to agricultural activity (even though they also include fisheries and forestry). The CRF category 4.A – Forestry is excluded from these graphs because this category represents a net sink and cannot be included in the pie chart.



3.1.2 Towards meeting the EU climate neutrality objectives

The EU's climate framework includes two key regulations:

- **the Effort Sharing Regulation (EU) 2018/842¹² (ESR)**, covering non-CO₂ emissions from agriculture (methane and nitrous oxide), and
- **the LULUCF Regulation (EU) 2018/841¹³**, addressing CO₂ emissions and carbon removals from Land Use, Land Use Change and Forestry.

The Effort Sharing Regulation (EU) 2018/842, which encompasses the agriculture sector, excluding land use, mandates an overall GHG reduction target of -40% by 2030, distributed among Member States. There are no specific EU or national targets set for agricultural emissions in the regulation, but the impact assessments of the Fit for 55 package and the 2040 climate target¹⁴ include some modelled trends per sector. The estimated potential contribution of the 19 CSPs assessed to the mitigation of non- CO₂ emissions from agriculture is **9 million tonnes per year, which represents 43% of the difference between 2021 estimated emissions levels and the figure associated with agriculture for 2030** as modelled in the impact assessments, for these 18 Member States.

The LULUCF Regulation (EU) 2018/841 sets an EU-wide net removal target of 310 million tonnes of CO₂e by 2030¹⁵. Based on the sector's average sink between 2016 and 2018, in order to achieve the EU target, an increase in carbon sink capacity of 42 million tonnes CO₂e is required. The analysis suggests that the 19 CSPs could contribute to enhancing carbon sequestration by approximately 22 million tonnes of CO₂e per year. **These yearly 22 million tonnes account for 8% of the**

¹² Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance), OJ L 156, p. 26–42, ELI: <http://data.europa.eu/eli/reg/2018/842/oj>.

¹³ Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from Land Use, Land Use change and Forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (Text with EEA relevance), OJ L 156, p. 1–25, ELI: <http://data.europa.eu/eli/reg/2018/841/oj>.

¹⁴ European Commission, *Commission Staff Working Document – Impact assessment report - Part 3 Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Securing our future - Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society*, 2024, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52024SC0063>; see Table 3 p. 8 ('Excludes fossil fuel combustion in the sector, but includes "category 3" CO₂ emissions, assumed constant at 10 MtCO₂').

¹⁵ Annex II of LULUCF Regulation (EU) 2018/841



LULUCF 2030 target and 56% of the required increase in sink capacity to achieve the LULUCF 2030 target, for the EU-18.

The mitigation effects of the CSPs are estimated on a yearly basis. This entails that the CSPs potential contribution to emission reduction and removal objectives could be delivered every year from 2023 to 2027, making the contribution quite significant. However, whether this potential will be fully realised, as well as the magnitude of the contribution to the 2030 LULUCF and ESR targets, will depend on the final uptake of the measures by farmers, whether supported practices will have additional effects each year, and whether these practices were already financed under the previous CAP programming period, which is not possible to assess at this stage. Actions outside the CSPs will also help reaching the 2030 LULUCF and ESR targets.

3.2 Carbon protection estimated potential contribution

The CSPs' GAECs and interventions also seek to protect the carbon stored in soils (grasslands, peatlands, arable lands) and woody features (forests, hedgerows) by maintaining these areas and encouraging sustainable management.

The analysis of the 19 CSPs indicates a potential positive contribution to the protection of existing carbon sinks of 29 million tonnes of CO₂e yearly across the EU-18.

Support to the maintenance of organic farming accounts for more than half (54%) of the estimated protection potential, followed by forestry maintenance (or management) (22%) and grassland protection (18%).

Maintenance of organic farming is supported through ENVCLIM and Eco-scheme interventions, whereas the INVEST interventions contribute to supporting sustainable forest management in certain Member States.

In the case of GAECs, due to the difficulty to quantify their contribution against a baseline, such as for GAEC 1 – Maintenance of permanent grassland, an obligation in place for many years, and the lack of information on the areas potentially concerned for GAEC 2 - Protection of wetlands and peatland, the applied conservative approach shows a small net additional contribution (these measures are mostly to maintain carbon in soils).

4 Recommendations for improvements

The estimation process delivers rough estimates with levels of uncertainty contingent on the information available in the CSPs, the applied mitigation coefficients and the assumptions made to estimate the area on which the farming practice is applied.



Several recommendations for improvement are included in the report, such as the use of local coefficients and data on the actual uptake of the interventions. These will improve the accuracy of the estimates. Recommendations are addressed primarily to National Authorities willing to enhance the estimation for the sake of improving the reporting to the United Nations Framework Convention on Climate Change and/or the assessment of the contribution of the CSP instruments on climate change mitigation.



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