Incentives for Climate Change Mitigation across the Agri-food Value Chain

Input paper #1 – Policy options[1]

1 Introduction

In February 2024, the European Commission published a Communication on the 2040 climate target[2] which proposed reducing EU GHG emissions by 90% in 2040 compared to 1990. While the accompanying Impact Assessment[3] demonstrates the overall feasibility of this ambitious goal, it also highlights the need for an increased effort to reduce emissions associated with agricultural production.

As the EU looks ahead to legislating a 2040 climate target, the Commission is assessing concrete policy options for the post-2030 legislative framework that could facilitate climate mitigation along the agri-food value chain. This includes addressing the recommendations of the European Scientific Advisory Board on Climate Change and the European Court of Auditors for applying carbon pricing to agricultural emissions and rewarding carbon removals in the land sector, as initially explored in the study on "Pricing agricultural emissions and rewarding climate action in the agri-food value chain", published in November 2023.

Scope of this paper

The objective of this input paper is to provide a framework to guide discussions during the first technical workshop organised as part of the stakeholder engagement component of the project *Incentives for Climate Change Mitigation across the Agri-food Value Chain* conducted by a consortium of Trinomics (project lead), IEEP, Ricardo and Wageningen University & Research for DG CLIMA.

This project aims to enhance the understanding of policy options for climate change mitigation across the agri-food value chain within the post-2030 framework. It is essential that the design of these policy options aligns closely with existing EU policies and that their evaluation considers the current challenges facing the sector, including threats to farm viability, income insecurity, and the decline of rural communities in some EU regions.

Reflecting the views expressed by many stakeholders at the project's opening event, there is a clear need for a comprehensive approach to emissions reduction in agriculture. This approach should involve all actors in the value chain, rather than placing the burden exclusively on farmers. In this process, it is important to address the challenges of dividing cost burdens and to ensure that broader sustainability issues are incorporated into agricultural policy decision-making. Reducing emissions while increasing carbon removals will require farm diversification, the adoption of new techniques, access to the right inputs, and the development of suitable downstream markets, all while minimizing risks to the sector.

While this input paper focuses on and analyses market-based mechanisms in climate mitigation in agriculture, it is important to maintain a holistic approach and consider the variety of existing regulatory and incentive-based approaches that are helping reducing emissions in agriculture and boosting carbon

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[2] COM(2024) 63 final
[3] SWD(2024) 63 final

sequestration in the land sector, and the need to assess market-based approaches as part of a package of possibilities. It also must be noted that within the common agricultural policy (CAP) incentives are provided to farmers to farm in a more climate friendly way. Incentive-based practices within agriculture have the potential to decrease emissions from the sector faster, while enhancing carbon removals in the land sector. Discussions on how to optimize and implement them in future policy are ongoing, but these are not part of this study.

Although agriculture and land are distinct areas within climate policy, they both involve complex natural processes managed by farmers. The initial study on "Pricing agricultural emissions and rewarding climate action in the agri-food value chain" recognizes this inherent complexity of agricultural systems and supply chains. This complexity involves indirect effects, trade-offs, political factors, administrative challenges, and international aspects, all of which require detailed analysis and consideration in discussing the policy options, and will be explored further as part of the project's workshop series.

Throughout the project, discussions with stakeholders will focus on exploring policy opportunities that create synergies between generating additional income streams for farmers, including through the development of new markets, and advancing an ambitious pace of decarbonization within the sector.

Taking existing incentive mechanisms within the voluntary carbon market as a starting point, this paper presents a range of possible policy approaches that could address current shortcomings and enhance incentives. A central focus of the paper is the point of obligation and the scope of agricultural and land-based emissions that could be included. Additionally, the paper discusses more detailed design features, such as participation thresholds, links with payments for removals, free allocation of allowances, and regulatory flexibilities.

The paper does not aim to provide a comprehensive overview of the broader environmental, social, economic, and administrative impacts of the options presented. Instead, related aspects such as effectiveness, competitiveness, distributional impacts, enabling factors, and the wider policy mix will be explored in greater detail in subsequent papers and technical workshops. Notably, the particular social impacts of a transition towards a more sustainable food system, as well as the mechanisms for the deployment of financial and investment support for the affected stakeholders, will be addressed in a dedicated workshop during the second half of the project.

Although the paper explores the potential for mobilizing action across the agri-food value chain, the scope of emissions covered by the policy options presented is limited to those from on-farm activities. This includes emissions from the agricultural sector (category 3 in UNFCCC reporting rules) and emissions and removals related to agricultural production in the relevant LULUCF sector categories of cropland and grassland (categories 4.B and 4.C in UNFCCC reporting rules). Emissions from on-farm energy use, as well as those associated with processing, transport, or waste along the agri-food value chain, are not included within this scope. Table 1 below shows a full overview of activities and GHG emissions associated with the agri-food value chain, while highlighting those covered within this study in colour in order to prevent misunderstanding and help focus discussion clearly.

Table 1. Activity and GHG emissions scope with those considered for the policy options outlined in this paper in colour

IPCC / national inventories		**Examples of activities**	**GHG**			**FAO**	
			CH4	N2O	CO2		
AFOLU	**AGRICULTURE**	Enteric fermentation	x			**AGRICULTURAL**	FOOD SYSTEMS
		Manure management	x	x			

		Synthetic fertilisers		x			
		Manure applied to soils		x			
		Manure left on pasture		x			
		Rice cultivation	x				
		Crop residues		x			
		Drained organic soils		x			
	LULUCF	Drained organic soils	x		x		
		Cropland management			x		
		Grassland management			x		
ENERGY		On-farm energy use	x	x	x	PRE AND POST PRODUCTION	
		Transport	x	x	x		
		Processing	x	x	x		
		Packaging	x	x	x		
		Fertiliser manufacturing	x	x	x		
		Retail - energy use	x	x	x		
INDUSTRY		Retail - refrigeration	x	x	x		
WASTE		Solid food waste	x				
		Incineration			x		
		Industrial wastewater	x	x			

Adapted based on: *https://essd.copernicus.org/articles/14/1795/2022/essd-14-1795-2022.html*

In the following chapters, this paper will outline three potential types of policy approaches designed to enhance market-based incentives for reducing agricultural emissions and increasing carbon removals in the agri-food sector. These approaches include: boosting voluntary carbon markets (Section 2), implementing mandatory climate standards (Section 3), and establishing compliance markets or emissions trading systems (Section 4). This paper extends beyond the policy options examined in the exploratory study "Pricing Agricultural Emissions and Rewarding Climate Action in the Agri-Food Value Chain," published in November 2023, by presenting possible policy alternatives to an agri-food emissions trading system.

2 Boosting finance for carbon farming

2.1 Status quo

Voluntary carbon markets (VCM) enable the trading of verified emissions reductions and carbon removals through carbon credits. From 2016 to 2020, the global voluntary carbon market expanded by 280%, with nearly 95 million carbon credits retired in 2020, valued at approximately $430 million[4]. Although agriculture represents a small segment of this market, it has been the fastest-growing industry in terms of credit supply. Between 2003 and 2022, around 20 million credits from agricultural projects were issued, supported by 11 certification standards, accounting for roughly 1% of the global VCM [5]. In 2021, over 700 agricultural projects generating voluntary carbon offsets were identified globally. The leading projects were focused on methane reduction (331 projects, resulting in 16.8 million tCO2-eq emissions reductions cumulative for all projects) and rice cultivation (277 projects, achieving 4 million tCO2-eq emissions reductions cumulative for all projects). Notably, over 90% of these projects (648) were aimed at emissions reductions, while fewer than 10% (71) combined carbon removals with reductions[6]. In terms of global distribution of agricultural carbon projects, North America (projects accumulating to 11.1 MtCO2-eq of emission reductions) and East Asia (projects accumulating to 8.1 MtCO2-eq) have the highest concentration of voluntary carbon offset projects. Projects in Europe, by contrast, accumulate to 900,000 MtCO2-eq.

Figure 1 Global Distribution of Agricultural Carbon Projects (VCM)

Source: Berkeley Carbon Trading Project

A 2021 study by IHS Markit estimated that the food and beverage sector accounts for 57% of the total potential demand for carbon credits tied to agricultural land globally. At the time of analysis, across various sectors, internal company prices for agricultural carbon credits ranged from $5 to $60 per ton of CO2 equivalent[7]. The study also found that many food and beverage companies are already working

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[4] Net-Zero-and-Voluntary-Carbon-Markets.pdf (vcmintegrity.org)

[5] https://foodpavilion.org/blog/programme/the-state-of-carbon-payments-and-the-voluntary-carbon-market-in-agriculture/

[6] https://www.cgiar.org/research/publication/agriculture-based-offsets-for-valuntary-carbon-markets-review-of-current-state-extent-of-markets-smallholder-and-gender-concerns-and-addressing-research-gaps/

[7] IHS - Carbon farming: Opportunities for agriculture and farmer to gain from decarbonization

with suppliers to reduce their carbon footprint, highlighting the private sector as a significant demand driver for both voluntary and compliance carbon markets today.

Many companies have committed to science-based targets that align with the goals of the Paris Agreement, pledging to achieve net-zero emissions by 2050, with interim targets set for 2030 to monitor progress. These targets typically cover not only direct emissions from operations but also indirect emissions across the supply chain. The Science-Based Targets initiative (SBTi) reported a nearly 150% increase in the number of companies in the food, beverage, and agriculture sector setting targets aligned with its methodologies between 2022 and 2023. As of December 2023, 337 companies in this sector across the globe had their targets validated by the SBTi[8] [9].

The demand for carbon credits has also been motivated by the role of climate claims in shaping consumer behaviour and investor sentiment. For consumers, transparent and credible climate commitments offer assurance that companies are actively addressing climate change, influencing purchasing decisions and fostering brand loyalty. For investors, clear and ambitious climate targets are crucial for assessing a company's long-term sustainability and risk management strategies. Companies that demonstrate robust climate commitments and effective emissions reduction strategies are more likely to attract investment and enhance their market reputation. In addition, voluntary carbon markets provide an opportunity for actors in the agri-food value chain to engage in climate mitigation activities for emissions where no regulated reduction mechanism yet exists. This motivation has seen the emergence of a number of initiatives, notably the Arla Foods' Sustainability Incentive Model discussed further below in this paper, or the French CARBON AGRI scheme[10]. However, several challenges have the potential to hinder the full mobilization of potential agricultural credits. Past experiences with carbon offset programs have shown the risks of relying on credits of uncertain quality, often exacerbated by weak governance processes. These risks can lead to greenwashing, where unreliable and low-quality certificates, potential fraud, errors, or double-counting result in carbon removal certificates that fail to meet the expected climate and sustainability standards. Such issues have eroded stakeholder trust in voluntary carbon markets. Corporations and governments aiming to support carbon removals may be reluctant to enter voluntary market transactions due to reputational risks from potential accusations of greenwashing, while customers and citizens may doubt their climate neutrality claims.

Additionally, strong technical and institutional capacity across entities involved in VCMs is crucial for generating a pipeline of high-quality carbon credits. Farmers may be hesitant to alter production practices to generate carbon credits of uncertain value and often face barriers to accessing finance. Given the uncertainty in the market, lending institutions may be reluctant to fund farmers who require specific assets for the production methods used in generating carbon credits.

2.2 Carbon markets – interactions with EU legislation

Corporations and other actors enter the voluntary carbon market for a variety of reasons, with compliance expected to gain increasing significance. In the EU context, certification is becoming increasingly crucial for supporting carbon removals through public policies and initiatives. The EU and its Member States are already implementing policies that incentivize carbon removal practices through public subsidies, such as those provided by the Common Agricultural Policy, and through public procurement mechanisms, including reverse auctions to purchase carbon removals and contracts for difference. The EU has also set ambitious sustainability targets within the LULUCF Regulation and the Nature Restoration Law, which will require effective mechanisms to attract private investment and

[8] SBTiMonitoringReport2023.pdf (sciencebasedtargets.org)
[9] Target dashboard - Science Based Targets Initiative
[10] France Carbon Agri (FCAA) | contribution et compensation carbone (france-carbon-agri.fr)

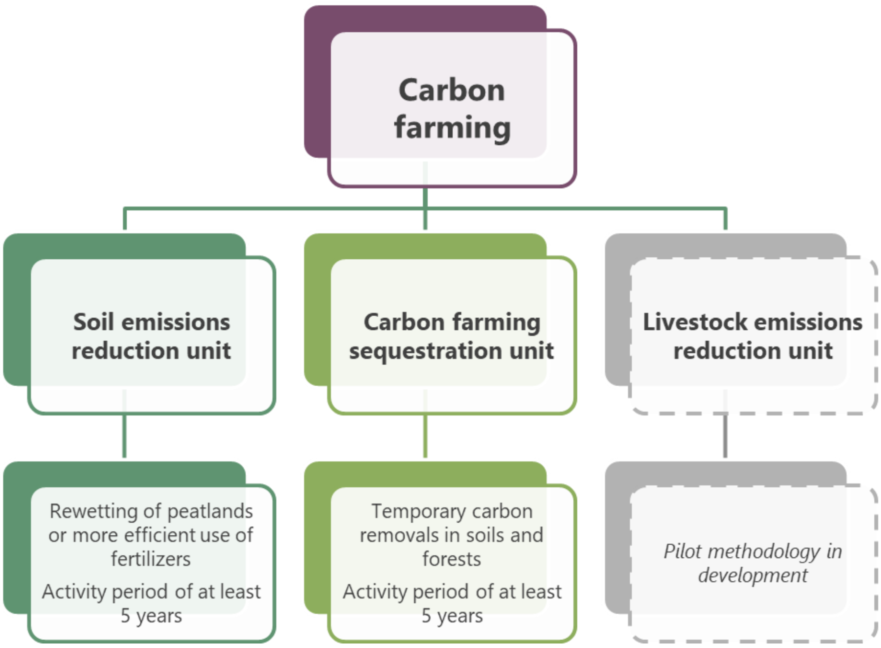
alignment of investment priorities between the financial and corporate sectors. Recently amended or adopted pieces of EU legislation, such as the Carbon Removal Certification Framework (CRCF), the Corporate Sustainability Reporting Directive (CSRD), Corporate Sustainability Due Diligence Directive (CSDDD), the Taxonomy Regulation, and the Green Claims Directive, are likely to influence how companies, including those in the agri-food value chain, engage with certification and use it to incentivise climate action.

2.2.1 Carbon Removal Certification Framework

The CRCF is a key piece of legislation in this context, intended to address the limitations and barriers associated with the existing VCM and facilitate the deployment of carbon removals and soil emissions reductions at scale.

The Regulation establishes a framework for certification of carbon removals and soil emission reductions, defining the scope of eligible activities, four quality criteria that must be met, as well as the rules for the certification process. The three groups of activities or projects that can generate units are permanent carbon removals (industrial carbon removal technologies), carbon farming (see below), and carbon storage in products (atmospheric and biogenic carbon storage in long-lasting products). Among these three, those under the category of carbon farming are of particular relevance to this discussion. The Regulation defines carbon farming to include activities such as carbon sequestration in soils and biomass and soil emission reductions resulting from e.g. peatland rewetting and optimized fertilizer use; with the minimum duration of carbon farming activities being five years. While livestock emission reductions are currently ineligible for certification under the Regulation, the Commission has been tasked with conducting a feasibility assessment by July 2026. This assessment will explore the potential for certifying activities that reduce agricultural emissions from livestock management (i.e. enteric fermentation and manure management) and inform the review of the CRCF in 2026.

Figure 2 Scope of certification in the CRCF



In terms of quantification, the regulation requires that carbon removals or soil emission reductions generated over the entire duration of an activity (referred to as the ‘activity period’) must outweigh any direct or indirect GHG emissions associated with implementing the activity. The first step in the quantification process is baseline setting, for which the regulation offers two possible approaches. It stipulates that the Commission will establish representative standardized baselines that reflect standard practices and the regulatory and market conditions in which the certified activity occurs. The key benefit of standardized baselines is that they recognize the early efforts of land managers and industries that have already engaged in carbon removal actions. Where standardized baselines cannot be set, the EU certification methodologies are intended to develop rules and default factors for operators to calculate their own activity-specific baselines.

Regarding *additionality*, the regulation defines additional activities as those that produce carbon removals and emission reductions exceeding the standardised baseline. When an activity-specific baseline is established instead, the activity must pass both a regulatory additionality test – showing that it goes beyond EU and national statutory requirements – and a financial additionality test – demonstrating that it has become financially viable due to the incentive effect of certification.

In terms of *storage durability*, the regulation requires that operators ensure storage of carbon resulting from carbon farming activities over a monitoring period, the duration of which will be defined in the methodologies. Certified units generated by carbon farming are assumed to be temporary and are set to expire at end of the monitoring period, unless the activity is renewed. The regulation sets out for the EU certification methodologies to define specific rules on monitoring and liability for potential reversal.

Finally, the regulation sets out rules regarding the general *sustainability* impacts, requiring that any certified carbon farming activities generate co-benefits for biodiversity, soil health, or avoidance of land degradation as a pre-condition for certification. It is assumed that these co-benefits will give more economic value to the certified units and therefore result in higher revenues for operators, incentivising a holistic approach to sustainability in agricultural production. As far as other environmental objectives (e.g. resilience, water, pollution, circular economy, mitigation beyond carbon removals and soil emissions reductions) are concerned, the activity cannot produce any significant harm, and any potential co-benefits can voluntarily be reported to increase the value of the certified units.

To operationalise the quality criteria, the Commission will develop EU certification methodologies by means of delegated acts, with the development process underpinned by the work of the Expert Group on carbon removals. The adoption of the Delegated Acts with the first certification methodologies for carbon farming (i.e. peatland rewetting, agriculture soil carbon with agroforestry, forestry) is foreseen for 2025, and further certification methodologies (e.g. livestock farming) will be developed over the following years and may be added to the framework, so that a comprehensive set of carbon farming activities can be eligible for certification well before 2030.

In terms of the *certification process*, the Commission will recognise (public or private) certification schemes that will be responsible for implementing the certification framework. The schemes will be responsible for appointing, training and supervising certification bodies, which will, in turn, conduct certification audits and issue certificates of compliance.

To ensure transparency and accountability, the Regulation mandates the disclosure of key certification information through a Union-wide registry known as the CRCF registry. This registry will include summaries of certification and re-certification audits, certificates of compliance, and details on the quantity and status of certified units (e.g., issued, retired, expired, cancelled, or set aside in a buffer to address reversal risks). Prior to the establishment of the CRCF registry in 2028, certification schemes will publish this information in their own registries.[11]

[11] For further information regarding the CRCF, see e.g. the Commission's CRCF FAQ: a8abe1c4-a3c6-4c94-be0e-4b76f7fd0308_en (europa.eu)

Although the units certified under the CRCF are based on a comprehensive assessment of emissions associated with the carbon farming activity, while the reporting of carbon removals and soil emission reductions toward EU climate objectives follows relevant EU legislation and IPCC rules based on separate categories (e.g. agriculture, LULUCF), the CRCF 'certificate of compliance' will provide important information for EU and national greenhouse gas (GHG) reporting, such as the gross amount of carbon removals and soil emission reductions directly generated by the activity.

2.2.2 Corporate Sustainability Reporting Directive

The Corporate Sustainability Reporting Directive (CSRD), adopted in 2022, significantly broadens the scope of previously existing sustainability reporting obligations both in terms of the range of corporate entities affected and the stringency of the requirements. The regulation mandates reporting from all 'large' EU-based companies and parent companies of groups classified as 'large' by meeting two of the following criteria: a) turnover exceeding EUR 40 million, b) balance sheet total exceeding EUR 20 million, or c) an average yearly number of employees above 250. It also extends to small- and medium-sized EU-based companies listed in the EU, as well as large non-EU companies with a net turnover of more than EUR 150 million in the EU for each of the last two consecutive financial years. The reporting obligations under the CSRD will be phased in between 2024 and 2028, starting with companies subject to non-financial reporting under current EU law in 2024, large companies in 2025, listed SMEs in 2026 and non-EU companies/groups in scope in 2028. Overall, it is expected to cover nearly 50 000 companies in the EU, compared to about 11 700 companies covered by the current rules.

The revised CSRD requires detailed reporting on companies' climate strategies, targets, and policies, as well as the leadership's capacity and incentives to achieve the strategic objectives. Reporting should also cover value chain due diligence and the management of relationships with customers, suppliers, and communities that are affected by the company's activities, including payment practices. Beyond climate mitigation, the CSRD mandates reporting on climate resilience, water use, biodiversity and social impacts.

The European Sustainability Reporting Standards (ESRS) outline the rules for preparing companies' sustainability statements. The initial set of sector-agnostic ESRS has been adopted through Commission Delegated Regulation (EU) 2023/2772. Additional sector-specific ESRS, including a standard for agriculture, are expected to be adopted by the Commission by 30 June 2026.

The dedicated climate reporting standard – ESRS E1 – outlines disclosure requirements related to corporate climate claims, including net-zero and climate neutrality goals. ESRS 1 requires companies to follow the principles and guidance provided by the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, calculating or estimating GHG emissions in significant scope 3 categories using appropriate emissions factors. The reported scope 3 GHG emissions for each significant category must be updated annually based on current activity data, with the full scope 3 GHG inventory updated at least every three years or following a significant event or change in circumstances. The requirement for comprehensive scope 3 emissions inventory is particularly significant in the case of the food sector, as scope 3 emissions can represent over 90% of a packaged food company's total emissions, with the majority arising from farm-driven processes. Companies must also disclose the extent to which their scope 3 GHG emissions are measured using data from specific activities within their upstream and downstream value chains, and the percentage of emissions calculated using primary data from suppliers or other value chain partners.

The ESRS E1 standard requires that value chain emissions be reported separately from GHG removals. It also differentiates between emission reductions or carbon removals achieved within the company's operations and value chain and those obtained through the purchase of high-quality carbon credits.

For carbon removals, the reporting must include information on the management of the risk of non-permanence.

The initial ESRS Delegated Act notes that a company’s ability to obtain necessary upstream and downstream value chain information may vary based on factors such as contractual arrangements, control over operations outside the consolidation scope, and buying power. If companies cannot obtain the required value chain information despite making “reasonable efforts,” they should use estimates based on “all reasonable and supportable information,” such as sector-average data and other proxies. The Act indicates that, particularly for environmental matters where proxies are available, companies may meet reporting requirements without collecting data directly from upstream and downstream value chain actors, including SMEs. It is anticipated that companies will rely more on estimates during the initial years of applying these reporting requirements, with the reliance on estimates decreasing as the sharing of sustainability information improves over time.

2.2.3 Corporate Sustainability Due Diligence Directive

A closely related piece of legislation, the Corporate Sustainability Due Diligence Directive (CSDDD or CS3D) requires companies to implement effective due diligence processes to identify, prevent, mitigate, and bring to an end potential and actual "adverse impacts" on human rights and the environment in the companies' own operations, upstream and some of the downstream value chain.

Importantly, the CSDDD obliges companies to put into effect a transition plan for climate change mitigation and aim "to ensure, through best efforts, that the business model and strategy of the company are compatible with" the transition to a sustainable economy, limiting global warming to 1.5°C, and the targets set out in the EU Climate Law.

The Directive applies to companies with more than 1,000 employees and net turnover of over EUR 450 million, with a planned gradual phase-in. The biggest companies (>5,000 employees and net turnover of EUR 1,5 billion) will be expected to comply by 2027, followed by companies with more than 3,000 employees and EUR 900 million in turnover by 2028, and all other in-scope companies by 2029.

2.2.4 Taxonomy Regulation

The EU Taxonomy is a green classification system that translates the EU's climate and environmental goals into specific criteria for economic activities, facilitating sustainable investment. It identifies economic activities as "green" or "environmentally sustainable" if they significantly contribute to at least one of the EU's environmental objectives without significantly harming others and meet minimum social safeguards. The Taxonomy Delegated Acts outline precise criteria for determining substantial contribution and no significant harm. As a transparency tool, the Taxonomy mandates disclosure obligations for companies and investors under the CSRD, requiring them to disclose their share of Taxonomy-aligned activities. This disclosure enables comparison between companies and investment portfolios, guiding market participants in their investment decisions.

The EU Taxonomy Climate Delegated Act currently covers approximately 40% of listed companies, encompassing sectors responsible for nearly 80% of direct GHG emissions in Europe. In terms of economic activities in the land sector, the Taxonomy Climate Delegated Act includes criteria for forestry activities which contribute substantially to climate mitigation and adaptation. While the EU Platform on Sustainable Finance's technical group has proposed recommendations for agriculture, the Commission has determined that further analysis of the screening criteria is necessary before including the sector in the EU Taxonomy.

2.2.5 Green Claims Directive

Finally, the proposal for the Green Claims Directive (GCD) aims to ensure that environmental claims made by companies in relation to goods and services are substantiated.

It builds on the amendment to the Unfair Commercial Practices Directive, referred to as "Empowering consumers for the green transition", which bans future environmental claims based solely on carbon offsetting schemes, requires third-party certification for all labels, and bans "generic claims", such as "green", "environmentally friendly", or "sustainable".

The Green Claims Directive sets out the rules for communicating and substantiating claims, including basing claims on widely recognised scientific evidence, taking a life-cycle perspective, and accounting for all the significant environmental aspects in the assessment of the environmental product's performance.

Climate-related claims, such as "carbon neutral" or "net zero", are especially prone to being unclear and ambiguous. To address this, the GCD proposal foresees delegated act(s) to provide further provisions on the substantiation of specific environmental claims, including climate-related ones.

Negotiations with co-legislators on the proposal are currently ongoing. Both the Council and the EU Parliament have introduced additional provisions that would be of relevance to the further development of VCMs if adopted, such as for example the EP's suggested ban for climate-neutral claims if based on offsetting.

Further notions introduced by the EP are contribution claims and compensation claims, without introducing specific definitions for these terms. Compensation claims based on carbon credits however could be made only in relation to residual emissions, credits would need to be CRCF-certified, and the share of residual emissions and the quantity of credits used and for which activity would need to be disclosed. In addition, compensation claims for fossil emissions could only be made based on permanent removals as per CRCF. Any claims on the future environmental performance based on the use of carbon credits would need to be in line with the CSRD's ESRS.

The Council includes the obligation to provide information about the type and quantity of carbon credits, and whether they are permanent or temporary, among others. Furthermore, the Council distinguishes between contribution claims (carbon credits to contribute to climate action) and offset claims (carbon credits to balance out an emissions share). In offset claims, companies would need to prove a net-zero target and show progress towards decarbonisation, as well as the percentage of total greenhouse gas emissions that have been offset. Negotiations are expected to resume in autumn 2024.

2.3 Policy interventions for boosting finance for certified on-farm climate mitigation activities

The existing regulatory framework, as outlined above, provides a strong foundation for developing policy mechanisms that will help mobilize private capital, which is crucial for the transition to sustainable farming practices. This section explores three types of possible policy interventions that could enhance the voluntary carbon market, stimulate demand for certified carbon removals and emission reductions, and offer greater financial certainty to farmers and other land managers.

2.3.1 Integration of CRCF methodologies into corporate sustainability reporting

As outlined in the previous section, the Corporate Sustainability Reporting Directive obligates all large and listed EU companies to measure and report on their scope 3 emissions and carbon removals. Introducing a stronger link to CRCF methodologies as part of the CSRD provisions could promote the harmonisation of scope 3 MRV approaches and facilitate wider uptake and understanding of best practices, without deploying more significant policy interventions involving target-setting or additional public finance provision.

The CSRD European Sustainability Reporting Standard "ESRS E1 Climate Change" establishes rules for quantifying GHG removals and storage, directing obligated entities to "apply consensus methods for accounting for GHG removals as soon as they are available, notably the EU regulatory framework for the certification of CO2 removals." This indicates a clear preference for using quantification methods aligned with those approved by the Commission in the certification methodologies.

To enhance the robustness of information reported under the CSRD and promote the harmonisation of scope 3 MRV approaches among the obligated companies, stronger requirements could mandate the use of CRCF quantification methodologies and of a CRCF-aligned certification process. Companies could aim to disclose the percentage of emissions and removals calculated using CRCF methodologies, primary data from farm operators, or data sourced from the CRCF registry.

The ESRS E1 reporting standard also specifies the rules for reporting by companies making climate neutrality and net-zero claims. For net-zero targets, companies must demonstrate how they intend to neutralize residual emissions, typically comprising 5-10% of total emissions by permanently removing an equivalent volume of CO2. In a further development of the standard and in light of the forthcoming CRCF methodologies, the CSRD could further strengthen the link to CRCF methodologies and certification process to demonstrate how any residual emissions are offset within the company's value chain.

For carbon neutrality claims involving carbon credits, the standard requires companies to demonstrate the credibility and integrity of the credits used, including adherence to recognized quality standards. Also here, a policy option could be to strengthen the link to CRCF methodologies and certification process to ensure the robustness of these claims.

2.3.2 Public procurement of CRCF units

The Commission and Member States could stimulate the demand for on-farm emission reductions and carbon removals by actively engaging in the direct purchase of CRCF units. Various approaches can address the potential drawbacks of straightforward direct procurement, many of which have proven effective in the case of the renewable energy sector. These policies have been crucial in significantly reducing renewable energy costs and advancing their competitiveness.

One such approach is Feed-in Tariffs (FiTs), which could be used to guarantee a fixed price for carbon removed over a specified period, ensuring stable income for operators of carbon removal projects. Typically, FiTs involve long-term agreements that secure a price higher than prevailing market rates for the duration of the payment period. This model, successfully used in renewable energy, could be adapted to incentivize carbon removals, with the Commission or Member States entering into long-term contracts with operators generating carbon removals or emission reductions, guaranteeing a fixed price throughout the contract period. Such a mechanism would reduce revenue uncertainty for farmers, while also lowering investment risks and costs for project developers, investors, and lenders and potentially enhancing farmers' access to finance. Importantly, this model could benefit smaller producers, fostering diverse participation and more equitable value distribution.

***Case study:* Luxembourg's Negative Emissions Tariff (L-NET) Bill**

Luxembourg's FiT bill, introduced to Parliament in 2022, establishes a framework for supporting atmospheric CO2 removal and long-term CO2 sequestration projects. Under this bill, eligible projects can enter into contracts with the Luxembourg government to receive subsidies for their negative emissions efforts.

According to the proposal, negative emissions providers can secure contracts with the Ministry of Environment for up to five years. To qualify, projects must capture or store a minimum of 100 tons of CO_2 per year, with a maximum of 10,000 tons per project annually. Projects must be based in Luxembourg or, if located abroad, at least 50% of the project leader's assets must be owned by Luxembourg entities.

Financial assistance under this system is calculated on a volumetric basis, with payments provided for each metric ton of CO_2 captured and/or stored durably during the contract period. The amount of financial support cannot exceed the maximum levels set by the Minister. Payments are contingent on the verification of CO_2 removal and/or storage. If delivery is not verified or if service is suspended, no payment will be made.

Such an approach offers several benefits as it is based on a well-established concept, with long-term government-backed contracts providing transparency, predictability, and reduced investment risks, which in turn lower financing costs and foster market stability. Additionally, Feed-in Tariffs (FiTs) can encourage participation from small and medium-sized businesses.

However, FiTs face challenges, such as difficulty in setting appropriate payment levels and adjusting for fluctuating costs. They can also be expensive and demand significant public funding, which may be limited and needed for other decarbonization efforts.

Competitive bidding through reverse auctions, as in the case of European Hydrogen Bank's support for RFNBO hydrogen, can address some of those disadvantages, as it provides more cost-efficient support allocated through a market-based instrument. A reverse auction mechanism would involve CRCF operators submitting bids for a public payment per tonne of CO_2, with the lowest bids winning. Auctions could be organised within pre-determined categories, depending on the types of underlying emission reduction and removal activities – or types of CRCF operators (potentially allowing smaller farmers to compete only against farms of similar size and capacity within a dedicated category).

Case study: **European Hydrogen Bank pilot auction**

On 23 November 2023, the Commission launched the first auction under the European Hydrogen Bank to support the production of RFNBO hydrogen. Through auctions, funding is allocated to technologies in an economically efficient way, allowing projects to move from first-or second-of-a-kind demonstration projects to broader commercial roll-out.

RFNBO hydrogen producers in any EEA country can benefit from the auction. The Innovation Fund has initiated a fixed-premium pilot auction for RFNBO hydrogen, allowing project developers to submit bids for a fixed premium payment per kilogram of produced hydrogen. Typically, bidders requiring the lowest public subsidy for an auctioned activity or product will win the subsidy.

The "Auctions-as-a-Service" model enables EEA Member States to utilize the Innovation Fund auction to allocate additional national funds to projects that did not receive support from the Innovation Fund's budget. This model offers Member States the opportunity to leverage the auction scheme, which is designed to comply with the Climate, Energy, and Environmental Aid Guidelines (CEEAG), and to streamline the State aid notification process using Commission-provided templates.

***Case study:* Swedish state aid for BECCS**

The Commission has recently approved the proposal by the Swedish Energy Agency for a EUR 3bn support system for BECCS using reversed auctioning, aiming to enable CCS as a viable tool to mitigate climate change. Auctions will be open to companies that (i) carry out an activity in Sweden, emitting biogenic CO2, and (ii) implement projects with a capacity to capture and store at least 50,000 tonnes of biogenic CO2 per year.

Under this system, a pulp and paper industry or a combined heat and power plant can submit a bid on how much carbon they can capture and store, and at what cost. Companies able to capture and store CO2 at the lowest cost win the auction.. According to the agency’s report, the costs are estimated at SEK 1,100–2,000 per tonne of CO2. The state aid will cover the costs of capture, transport and storage during a binding period of 15 years.

Auctions have a lower administrative burden for applicants than other grant processes, with less documentation required, while allowing for price discovery and market formation. However, a key concern with competitive bidding is that it may disadvantage smaller operators, who often face higher costs. Additionally, depending on the nature of the underlying activity, lower-priced credits might indicate lower robustness, even with CRCF safeguards in place. Another important consideration is that such funding mechanisms require substantial public investment, which may divert resources from other policy objectives.

2.3.3 Facilitation of forward contracts for CRCF units by public authorities

Another approach to increase finance for CRCF units and thereby incentivize farmers to employ climate mitigation practices could be for the Commission or the Member States to implement a program facilitating forward contracts for the purchase of CRCF units. In a forward contract, counterparties agree to trade allowances or offsets at a predetermined price on a specified future date (the contract’s expiration date). While the price is established at the time when the forward contract is negotiated, the transfer of ownership of the actual allowances occurs only upon the contract's expiration.

In such a system, CRCF operators seeking to enter forward contracts for their anticipated units could submit an application containing details of the carbon removal or emission reduction projects to the Commission or Member State authorities. The Commission would ensure robust due diligence, leveraging the safeguards embedded in the CRCF certification process and effectively connect successful applicants with interested buyers, such as companies, financial institutions, regional or local public authorities, or municipalities. Forward contracts could be offered to buyers for projects that have successfully completed the initial certification stage, meaning they have received a first certificate of compliance and have been approved for implementation based on activity and monitoring plans. The Commission or Member State authorities would then facilitate the drawing up of the contract agreement by coordinating with each CRCF operator to identify the volume of units and annual prices and ensuring that buyers form a specific supplier sign identical contracts with individualised volumes as needed.

An alternative approach may involve the Commission or Member States arranging auctions of forward contracts, with the possibility for the public authority in charge to determine minimum prices, trade size or other parameters. Buyers would be invited to submit bids to compete against each other, starting at the threshold defined by the Commission, with the bid increasing gradually. The auctioning approach would involve the sale of forward contracts to the highest bidders in the private or public sector.

The primary objective of public authorities assuming a role of intermediaries in such a system would be to signal a more stable demand for CRCF units and increase revenue certainty for farmers. For both operators and buyers, forward contracts help mitigate market price risks and ensure a fixed transaction price, even if delivery is deferred for several years. This arrangement protects operators from falling market prices and buyers from rising prices or potential shortages in the spot market. Forward contracts can specify either a fixed number of units or a number proportional to the anticipated size of the project to be delivered. By providing predictability and reliability in future cash flows, forward contracts can be an essential tool for securing financing for GHG mitigation projects. Since forward contracts can be customized by market participants rather than being standardized, they could include details about anticipated co-benefits and potentially a related price premium. Generally, this mechanism is particularly valuable in the early stages of a market, as it facilitates the emergence of new products that can be further standardized and traded on exchanges at a later stage.

***Case study:* Frontier – system of advance market commitments for permanent removals**

Frontier is an advance market commitment to buy an initial $1B+ of permanent carbon removal between 2022 and 2030. It was founded by Stripe, Alphabet, Shopify, Meta, McKinsey and other businesses using Stripe Climate. It aims to accelerate the development of carbon removal technologies by guaranteeing future demand for them. Frontier facilitates carbon removal purchases on behalf of buyers that have joined program, following three steps:

1 | Frontier aggregates demand to set an annual maximum spend

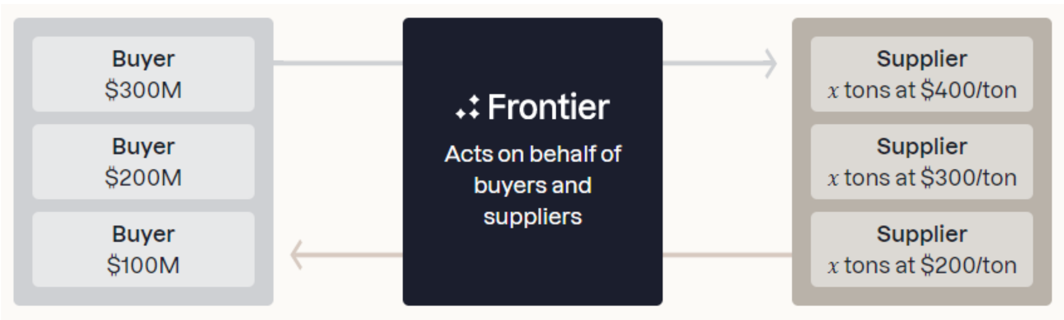
- Buyers decide how much they want to spend on carbon removal each year until 2030. Frontier aggregates commitments to set a total annual demand pool. Suppliers apply for consideration as part of a regular process, initiated by Frontier issuing a request for prepurchase proposals (RFP) .

2 | Frontier vets suppliers and facilitates carbon removal purchases

- For early-stage suppliers, agreements will likely take the form of low-volume prepurchases. For larger suppliers ready to scale, Frontier will facilitate offtake agreements to purchase future tons of carbon removal at an agreed price if and when delivered.

3 | Suppliers remove carbon and pass tons back to buyers

- When tons of carbon are removed, suppliers get paid. In the case of offtake agreements, tons are issued back to buyers.



One of the largest sets of offtake agreements facilitated by Frontier links buyers to Charm Industrial, a biomass carbon removal and storage (BiCRS) project. Charm Industrial's approach involves transforming waste biomass, such as agricultural leftovers or materials cleared during forest fire prevention, into bio-oil via pyrolysis. This bio-oil is then injected into EPA-regulated wells, where it solidifies, locking away the carbon. Frontier buyers will pay Charm to remove 112,000 tons of CO_2 from the atmosphere and store them permanently underground between 2024 and 2030. Buyers will pay a price per ton that will decline by at least 37% between 2024 and 2030 and could decline by as much as 75% based on Charm's current scaling plans and the potential for expanded government incentives. The price accounts for both the removal itself as well as measurement, reporting, and verification.

3 Mandatory Climate Standards

Another potential policy approach to further incentivize climate action along the agri-food value chain could involve introducing mandatory scope 3 emission reduction requirements for large businesses, specifically targeting companies downstream from on-farm activities. This approach would capitalize on the existing momentum from corporate climate commitments and recently adopted corporate sustainability legislation.

A key advantage of this policy, compared to increasing the use of CRCF certification in the voluntary carbon market, is that it would provide greater planning certainty for farmers and foresters, by ensuring an increased demand for on-farm climate actions driven by compliance needs, driving an increase in prices[12]. The complex, burdensome, and unpredictable nature of the offset crediting process often means that existing financial incentives in voluntary markets fall short in motivating farmers to adopt new sustainable practices for certification[13]. This undermines the uptake of such practices, especially when facing low or uncertain carbon credit prices.

This policy direction aligns with current market trends, as many large companies have already committed to reducing their Scope 3 emissions, particularly under the SBTi FLAG approach. Additionally, it could build on recent requirements established under the CSDDD, which mandates the largest EU companies to develop and implement transition plans consistent with limiting global warming to 1.5°C, covering their scope 3 emissions.

***Case study:* The Science Based Targets initiative's target-setting approach for Forest, Land and Agriculture**

The SBTi's Corporate Net-Zero Standard is the world's only framework for corporate net-zero target setting in line with climate science. It includes the guidance, criteria, and recommendations companies need to set science-based net-zero targets consistent with limiting global temperature rise to 1.5°C. The standard is voluntary and global in its reach, with 4,000 companies setting targets or committing to do so via the SBTi as of the end of 2022.

In September 2022, following the launch of its Net-Zero Standard in 2021, the SBTi introduced the Forest, Land, and Agriculture (FLAG) target-setting framework. Companies are required to set a FLAG target if they meet either of the following criteria:

1. They belong to FLAG-designated sectors, including:
   - Forest and Paper Products: Forestry, Timber, Pulp and Paper, Rubber.
   - Food Production: Agricultural Production, Animal Source.
   - Food and Beverage Processing.
   - Food and Staples Retailing.
   - Tobacco.
2. Their FLAG-related emissions constitute 20% or more of their overall emissions across scopes 1, 2, and 3.

For companies with diversified, land-intensive activities in their supply chain, as well as those in midstream and downstream sectors, the FLAG target must be based on a sector-specific absolute

[12] The increase in price would be a consequence of higher demand due to companies being required to purchase credits from farmers. Credit prices need to at least cover any potential costs for farmers in order to create a supply.

[13] https://www.nature.com/articles/s44168-023-00055-4

reduction, with a required annual reduction rate of 3.03%. This means that the reduction rate corresponding to ten years (e.g., from base year 2020 to target year 2030) is a 30.3% reduction for a company using the FLAG sector pathway rate[14]. This rate, is based on the science outlined in the review paper by Roe et al. (2019). The FLAG sector pathway integrates top-down global emissions trajectories with bottom-up studies on the mitigation potential of land-based activities, categorized into seven priority mitigation measures (wedges): reducing land-use change (LUC), improving agriculture, shifting diets, reducing food loss and waste, restoring forests, improving sustainable forest management (SFM) and agroforestry, and enhancing agricultural soil carbon. The overall reduction rate of 3.03% includes both emission reductions and removals.

Companies with FLAG emissions in scope 3 are expected to collect high-quality data from suppliers and value chain partners, following the GHG Protocol Land Sector and Removals Guidance. The standard allows for the use of default activity data, while cautioning that it limits a company's ability to track performance and progress toward targets. If used, emission factors should be representative of the corresponding commodities (i.e., country emission factor should be used as minimum) and the potential uncertainty of the adopted default data should be clearly disclosed. Companies on the demand-side with complex supply chains may focus data quality and disaggregation on critical commodities. To help identify the main carbon-intensive commodities or products in their supply chain, companies may refer to the 11 commodities included in the FLAG commodity pathways as well as the main deforestation-linked commodities listed in this guidance. Demand-side food and beverage retail companies with highly transformed products may report their data per product (e.g. yogurts, chocolate, pasta), instead of per agricultural commodity. In this case, companies should list each individual product and associated emissions as well as sum the overall emissions from the product category.

While proxies are allowed for agricultural emissions, companies must rely on primary data for land removals. Land removals should only be included in a company's inventory and target coverage if there is sufficient traceability to the land where the removal occurs, the removal figures are verified by a third party, and there is ongoing carbon storage monitoring. The standard also stipulates that removals on land supplying commodities to multiple companies must not be double-counted in each company's inventory, and land-based removals credited and sold as offsets cannot be used to meet FLAG targets.

To avoid double reporting of carbon farming interventions, companies must demonstrate that farmers and their surrounding areas have not participated in other carbon credit schemes, governmental carbon reduction programs, or other supply chain decarbonization initiatives that could lead to the same farmers being counted in another company's scope 3 emissions.

Companies are not required to include iLUCs in their GHG inventories, but the SBTi recommends tracking iLUC following the GHG Protocol Land Sector and Removals Guidance on land tracking metrics.

3.1.1 Possible emission reduction requirements

The 2040 Climate Target Impact Assessment evaluates various climate mitigation scenarios using a set of key criteria: ensuring climate neutrality, minimizing the EU's greenhouse gas (GHG) budget, ensuring a just transition, maintaining the long-term competitiveness of the EU economy, providing predictability

[14] As highlighted in the "SBTi Forest, Land and Agriculture (FLAG) Project FAQs", the specific reduction rate will depend on a company's base year and target year: https://sciencebasedtargets.org/resources/files/FLAG-FAQ.pdf

for deploying best-available, cost-effective, and scalable technologies, ensuring energy and resource supply security, and ensuring environmental effectiveness.

The assessment identifies Scenario S3, which targets a net emission reduction of 90-95% by 2040 compared to 1990 levels, as the most favourable based on these criteria. The modelling for this preferred scenario suggests that agricultural emissions could decrease to 271 MtCO2-eq by 2040, assuming no changes in food production levels. Maximum residual emissions in 2050 are estimated at 249 MtCO2-eq, enabling the necessary economy-wide reductions and ensuring fair contributions across sectors.

Furthermore, the assessment demonstrates that with demand-side actions, such as a 25% shift towards the diets recommended by the EAT-Lancet Commission and a reduction in food waste, agricultural emissions could potentially decrease further to 209 MtCO2-eq by 2040 and 194 MtCO2-eq by 2050.

Based on the minimum reduction requirements outlined in the S3 scenario, farm emissions would need to decrease by approximately 1-2% annually between 2030 and 2050, following a linear trajectory and considering current estimates of agricultural emissions until 2030 with additional measures. Downstream actors could be required to reduce their scope 3 farmgate emissions year-on-year in alignment with this pathway and provide evidence in their reporting.

In addition, obligated entities could gradually be required to increase carbon removals within their supply chains, ensuring that carbon removal targets do not deter efforts to reduce emissions (i.e. they remain well below the standard 5-10% of total emissions typically accepted as a rough estimate of residual emissions).

3.1.2 Potential policy scope – obligated actors

Mandatory emission reduction obligations could be placed on various downstream actors within the agri-food value chain, with the choice of actors guided by the specific objectives of the policy. For instance, if the policy aims to influence consumer behavior and shift demand, targeting actors closest to the consumer, such as retailers, would be a logical approach. Key actors to consider in this context include animal feed manufacturers, food processors, and retailers.

The EU's renewable energy policy offers an example of a relevant framework which may provide a blueprint for regulating scope 3 emissions reductions by agri-food downstream actors. The Renewable Energy Directive imposes specific GHG savings requirements on a lifecycle basis for biofuel manufacturers receiving state aid, effectively capturing scope 3 on-farm emissions resulting from e.g. crop cultivation. These requirements have successfully motivated some of the regulated actors to incentivize farmers in their supply chains to employ more sustainable farming practices, as described further below.

Case study: Sustainability and GHG savings criteria for biofuels under the Renewable Energy Directive

In 2018, the RED II[15] introduced sustainability and GHG emission savings criteria for biofuels, bioliquids and biomass fuels which must be met for the fuel to be eligible for subsidisation and counting towards renewable energy targets. The criteria became subsequently more stringent with the amendment in 2023[16]. As part of this, installations producing biofuels, bioliquids and biomass fuels exceeding legally defined thermal input thresholds are required to prove that biomass used is

[15] Directive - 2018/2001 - EN - EUR-Lex (europa.eu)

[16] Directive - EU - 2023/2413 - EN - Renewable Energy Directive - EUR-Lex (europa.eu)

sustainably sourced and that the fuel produced is achieving GHG emissions saving criteria set relative to fossil fuel emissions.

Requirements for GHG emission savings vary by the end use and are subject to gradually more stringent thresholds. The required savings range from 50%-65% for biofuels used in transport to 70%-80% for biomass fuels used for electricity, heating and cooling production. Within these categories, thresholds depend on the plant operation start date, operating period, and installation size.

The calculation of emissions is based on a lifecycle GHG analysis, which includes emissions from the extraction or cultivation of raw materials, processing and transport of the biomass to the processing facility. Within the calculation of extraction and/or cultivation of feedstock, emission savings from soil carbon accumulation via improved agricultural management or manure management are included, too.

The estimates of GHG emissions from the cultivation of agricultural biomass may used from the Annexes V and VI (default values) or can be calculated at the NUTS2 level or as actual values for a specific practice (Article 30), using the methodology defined in Annexes V and VI. The methodology leans as much as possible on the IPCC 2006 Guidelines 2019 refinement. In the absence of relevant information, it is allowed to calculate averages based on local farming practises based for instance on data of a group of farms, as an alternative to using actual values.

GHG savings from soil carbon accumulation via improved agriculture management or by preventing methane leakages and N2O emissions from fossil fertilizer in land management, such as shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, application of digestate, etc. can be considered "only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use". This opens opportunities for a wider application of biomass cultivation and extraction part than for bioenergy only within the established structure of voluntary certification scheme thus minimizing additional administrative burden while ensuring level played field for biomass producers.

The RED II criteria provide a useful blueprint for possible new policy approaches targeting scope 3 emissions in the value chain of agri-food actors. While biofuel manufacturers may opt to target other parts of the value chain to meet the LCA GHG savings criteria, such as processing or transport, there is also evidence of biofuel producers engaging farmers in their supply chain to use less GHG-intensive agricultural production methods, as demonstrated in the example below.

***Case study:* Saipol supplier premium**

In 2020, Saipol, a biodiesel manufacturer, introduced a "GHG bonus" program for farmers who could demonstrate a low carbon footprint for their rapeseed crops, with the initiative being driven by the GHG savings requirements under the RED II. Farmers interested in participating are asked to input data for both 2008 and the current year into an online system. Based on this information, their cooperative may contact them to verify the data, provide guidance on reducing their GHG footprint, and potentially offer them a contract for their "low GHG rapeseed."

This low-emission rapeseed earns farmers a premium of €0-50 per ton, depending on the verified GHG budget, which can represent up to 10% of the 2023 rapeseed price. To ensure accuracy, a document-based audit is conducted on all participating farms, reviewing areas, yields, and nitrogen inputs based on CAP declarations, accounting records, and fertilization logs. Following Saipol's lead, other supply chains have introduced similar premiums, with companies like Nestlé offering incentives for low-carbon popcorn maize, Danone and Sodiaal for milk, and Cristal Union for beetroots.

The following section explores examples of how Mandatory Climate Standards could incentivize on-farm emissions reductions and contribute to overall mitigation in the sector through the different mechanisms available to actors in the agri-food value chain. Additional considerations regarding the selection of actors and the scope of emissions coverage are discussed in section 4.1.1.

Feed producers

Feed production is a major source of emissions due to the extensive land use and the inputs required to grow animal feed, thus scope 3 emission reduction requirements on feed producers could play a significant role in reducing soil N2O emissions.

When feed is produced intensively or in close crop rotations and far from where animal husbandry takes place, it necessitates the intensive use of mineral fertilizers, whereas the on-farm production of feed normally leads to less intensive use of mineral fertilizers. At EU level, it is difficult to identify a dominant feeding strategy by livestock type due to the production specificities: monogastrics, whose diets mainly consist of cereals and oilseed meals (such as soya bean, rapeseed, and sunflower meals), rely more on extra-EU imports. In contrast, ruminants, which are primarily fed forage, are less dependent on imports and can rely more on on-farm produced feed like grassland. As the EU is currently lacking "self-sufficiency"[17] in high-protein crops for feed, feed imports are necessary, particularly from Argentina, Brazil, and the United States. These imports can be associated with land-use change, a factor that, while challenging to monitor, could gradually be incorporated into feed producers' scope 3 emission reduction obligations[18]. This could build on the approaches developed under the Renewable Energy Directive in the context of sustainability criteria for biofuels. Feed producers and wholesale traders can address their scope 3 emissions by engaging with suppliers to mitigate or eliminate land-use change emissions and by promoting more sustainable cultivation practices, such as more efficient fertilizer application.

Another key strategy is to enhance circularity and diversify sources in feed production by recovering nutrients from other industrial processes in the food and biofuel chains, such as by-products from wheat and rice milling, fruit processing, industrial fermentation biomass, and beer brewing, as well as from insects or fresh grass juices. Emission reduction obligations could also drive innovation and the adoption of emerging alternatives like algae, phosphate minerals, or single-cell proteins.

Food processors

Food processors have several avenues to reduce emissions, including:

- Supplier incentive programs: Processors can incentivize supplier farms to adopt emission-reducing practices, such as offering price premiums for specific manure management techniques, precision feeding strategies, or for feed additives. Support can also include

[17] According to the FAO (2016), 'self sufficiency' is defined as the ability of a region or country to produce enough food (especially staple crops) without needing to buy or import additional food.

[18] It should be noted that any such policy requirements can only be imposed on products placed on the EU market, while ensuring compliance with the WTO rules. Trade-related implications of policy options will be discussed in subsequent workshops.

resources for transitioning to overall agroecological and regenerative principles in farm management, collaboration on emission reduction targets, and financial incentives or grants to farmers. Working with financial institutions to provide financing for farmers, or establishing horizontal agreements within competition rules, can further support these efforts.

- Diversifying product portfolios: Expanding product lines to include more plant-based or lower-emission options, though this may be less feasible for smaller processors, especially those specialized in meat processing.
- Product reformulation: Downstream processors, such as ready-to-eat food manufacturers, can reformulate products to reduce meat or dairy content, or substitute animal-based ingredients with plant-based alternatives.
- Marketing strategies: Shifting marketing efforts towards plant-based and lower GHG-intensive products can influence consumer choices, increasing awareness and accelerating sales of reformulated products.
- Waste reduction and efficiency improvements: Reducing waste and improving efficiency can lower the need for raw materials.

***Case study:* Arla Foods' Sustainability Incentive Model**

In 2020, Arla began annual data collection under its Climate Check tool, which serves to assist dairy farmers in measuring and reducing their GHG emissions. The data collection tool features over 200 questions on subjects such as feed, energy use and manure management, and allows for the calculation of the carbon footprint of milk production at farm level. Participation in the scheme is voluntary for conventional producers and mandatory for organic producers.

Building on the Climate Check tool, Arla has introduced a point-based Sustainability Incentive model to help fund and motivate actions required to hit its 30% emissions reduction target by 2030 against a 2015 baseline. Within this model, farmers can collect points based on past and future environmental sustainability activities under 19 different levers. The levers with the biggest potential to reduce a farm's carbon footprint (including e.g. feed efficiency, fertiliser use, land use, protein efficiency and animal health) are associated with a higher total amount of points available. Other areas of action relate to sustainable feed, renewable energy usage and biogas production. Not all levers directly impact the farm's carbon footprint; some relate to other factors, such as feed monitoring or knowledge-sharing among farmers.

The model currently allows farmers to score a maximum of 80 points, with more options to be built into the scheme over time, increasing to a total number of 100 points. Farmers can receive 1 eurocent per kilo of milk delivered to Arla for submitting Climate Check data, which is the prerequisite for receiving the sustainability incentive. In addition, for each point awarded through the Sustainability Incentive model, they can receive 0.03 eurocent per kilo of milk. Once the model has been developed to comprise a total of 100 points, farmers can eventually be granted 4 eurocents per kilo of milk. On this basis, Arla estimates that up to 500 million euros may be allocated to farmers to reward sustainable farming practices. In the first full year, at least 270 million euro is expected to be distributed through the monthly milk price with an estimated average of 39 points scored.

Retailers

Retailers' position at the interface with consumers opens several options for driving sustainable transition in the agri-food sector by addressing the demand side. Some of the related strategies available to retailers include[19]:

- diversifying the product portfolio by increasing the availability, choice and affordability of sustainable options, including local foods and specialties, vegan choices, and alternatives to animal-based products;
- creating shopping experiences that facilitate sustainable consumer choices (e.g. through placement of products and store lay-out; opening exclusively plant-based store branches[20]);
- informing customers about product sustainability, e.g. through responsible-choice labels, environmental labelling, disclosing climate-relevant information;
- pricing strategies, e.g. reflecting the true cost of food[21].

Big retailers can also leverage their role by steering the broader market through their supplier policies and engagement, including e.g. the sharing of best practices, design of internal procurement guidelines to prioritise suppliers compliant with defined sustainability criteria, or introducing a supplier code of conduct with mandatory requirements, e.g. for emissions disclosure.

Placing scope 3 emission reduction obligations on several types of downstream actors

A policy tool that mandates actors to demonstrate a gradual reduction in their scope 3 emissions through sustainability reporting offers considerable flexibility in selecting which actors to target. There are no restrictions on the choice of actors, and multiple actors within the same value chain can be chosen without risking double-counting emissions with appropriate safeguards. In fact, imposing obligations on various entities within the same value chain can align compliance efforts and incentives across the chain. This alignment can drive upstream actors, such as farmers, to prioritize on-farm mitigation, making these efforts more valuable in the market as they result in outcomes which are desirable for multiple downstream actors. There are examples of voluntary vertical partnerships between value chain actors created for the purpose of supporting the adoption of more sustainable practices at farm level, such as e.g. the partnership between Mondelez International, a multinational confectionery company, and Olam Group, a commodity trader, to test scalable solutions for sustainable cocoa farming[22]. Introducing compliance-related incentives along the value chain could stimulate similar initiatives, with a stronger focus on supporting existing suppliers.

The choice of which actors to target will not only shape the available climate mitigation incentive mechanisms but also influence outcomes related to consumer choices and market competitiveness. For instance, placing obligations on large food processors might exclude small local and regional traders or non-processed food sectors from these requirements. These and other considerations will be explored in greater detail in subsequent workshops.

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[19] https://www.mdpi.com/2071-1050/13/1/96
[20] https://www.rewe-group.com/en/press-and-media/newsroom/press-releases/rewe-opens-its-first-exclusively-plant-based-supermarket/;
[21] https://www.rewe-group.com/en/press-and-media/newsroom/press-releases/penny-labels-its-first-products-with-true-prices/
[22] https://www.mondelezinternational.com/news/partnership-with-olam-to-create-largest-sustainable-commercial-cocoa-farm/#

3.1.3 Contribution of CRCF units to the regulated entities meeting their obligations

As outlined, the policy option requires obligated entities to reduce their scope 3 emissions – those generated within their value chains – using data reported according to methodologies likely already familiar to them, such as those mandated by the Corporate Sustainability Reporting Directive (CSRD) and the GHG Protocol. The CRCF methodologies are expected to bring greater harmonization and detail to emission reduction reporting and can be integrated into the reporting requirements established by this policy.

Under this policy, companies could purchase units from producers within their own value chains as a way to incentivise emission reductions. Additionally, they would have the opportunity to report on the related co-benefits as part of their non-financial reporting. The design of Monitoring, Reporting, and Verification (MRV) requirements would need to carefully consider how these rules influence companies' incentives to engage in the carbon market.

Another aspect to consider is whether companies should be allowed to use units generated outside their regulated value chains to compensate for their emissions and count these certified units towards their emission reduction obligations. Two scenarios could be envisioned here:

- Within-system credit trading: In this scenario, companies would only be allowed to purchase CRCF units from farm operators within the supply chains of other actors subject to the same emission reduction requirements. The CRCF units would stay within the same system, and the company in whose supply chain the emission reduction occurred would adjust its scope 3 emissions balance accordingly. This could incentivize companies to ensure that farmers within their supply chains sell CRCF units to them, potentially by offering a higher price. It could also lead to greater efficiency by allowing overachieving companies to sell units to others within the system. Similar to how countries with net-zero targets make corresponding adjustments when trading, this within-system credit trading could ensure overall benefit and address potential integrity concerns. However, ensuring accurate adjustments and defining clear boundaries between supply chains would pose significant challenges.
- Outside-system credit trading: The second scenario involves companies purchasing CRCF units from suppliers outside the regulated (value chain) system. This approach introduces greater risks related to additionality and double-counting, which may be difficult to address.

Overall, retaining credit trading within the system and ensuring proper adjustments between companies could help maintain the integrity of the policy, but it would require careful implementation to overcome the associated challenges.

***Case study:* The Science Based Targets initiative's Corporate Net-Zero Standard – approach to the use of carbon credits**

SBTi standards require that carbon credits are not counted as emission reductions toward the progress of companies' science-based targets. However, recently released technical publications, delivered as part of its review of the Corporate Net-Zero Standard, explores the scenario in which carbon credits from mitigation activities within the value chain are used to substantiate value chain emission reduction claims whenever they represent emissions abatement (i.e. emission reduction within the value chain, as opposed to emissions avoidance or carbon dioxide removal) from activities traceable to the company's value chain. Such credits would be accounted for in a way that can be fungible with corporate GHG emissions inventory.

Separately, the SBTi foresees a role for the purchase and retirement of high-quality carbon credits to support beyond value chain mitigation (BVCM) as one of several instruments that can help businesses contribute to the broader societal shift towards net-zero. The traditional practice of offsetting, which involves purchasing carbon credits as a substitute for abating value chain emissions, is not accepted under SBTi standards due to potential risks. Cognizant of these risks, while also recognising the importance of stimulating corporate finance towards mitigation activities in critical need of funding, the technical paper investigates scenarios in which companies are incentivized to abate emissions within the value chain while also taking responsibility for emissions not yet addressed.

4 A trading system for emissions reductions and removals for the agrifood value chain (Agrifood ETS)

A GHG compliance market for the agricultural sector could involve the trading of emission reduction and carbon removal credits. As a market-based mechanism, an emissions trading system is designed to incentivize climate mitigation by imposing a cost on pollutants, thereby encouraging regulated entities to reduce their emissions. Depending on its design, an agri-food ETS could not only address the negative externalities of agricultural production but also incentivise carbon removals in the land sector, either through the targeted use of ETS revenues or by directly integrating carbon removal credits into the system.

In a 'cap-and-trade' system, a central public authority sets an upper limit on emissions (the 'cap'), and issues permits, or allowances, for each unit of emissions allowed under the cap. Every polluter covered by the system is required to obtain and subsequently surrender a permit for each unit of GHGs that they emit. Allowances can be purchased in an auctioning process coordinated by the government, received for free as part of free allocation, or purchased on the secondary market from other ETS participants.

Over time, the cap is tightened to ensure emission reductions, enforced through an increasingly limited supply of allowances. The possibility of trading allowances on an open market provides regulated entities which have succeeded in reducing emissions faster with the option to sell their spare allowances to another ETS participant. On the other hand, if they find their emissions particularly costly to abate, they can buy allowances instead. Spare allowances may also be saved for future compliance (the banking of allowances).

An ETS is considered a cost-effective tool because it ensures that the least expensive emission reductions are made first. Companies that reduce their emissions below the required limit can either retain their excess allowances for future needs or sell them to other companies that need them. This system incentivizes entities with low abatement costs to reduce emissions while allowing those facing higher costs to comply by purchasing allowances.

The design of an emissions trading system involves several key policy choices with the potential to significantly influence the system's effectiveness and efficiency. This section will explore the following design elements: emissions and removals scope, point of obligation, inclusion threshold, cap setting, monitoring, reporting, and verification (MRV) approach, and use of revenues.

4.1 Setting a cap

An ETS cap establishes a limit on the total volume of emissions from regulated entities and is gradually reduced over time to guide mitigation efforts towards a specific emissions reduction target. This reduction is implemented by decreasing the number of allowances available through auctions or free allocation each year. As a result, allowances become scarcer and more expensive, creating the basis for the ETS price signal. The rate at which the cap is reduced is defined by a linear reduction factor (LRF), which dictates the pace of emission reductions.

Setting the ETS cap should be informed by the EU agricultural sector's historical and projected emissions, as well as by mitigation costs and opportunities. It must also be based on a thorough understanding of baseline emissions. As in the case of ETS II, a pilot MRV phase-in period may be beneficial for gathering more accurate data and allowing regulated entities to adjust to new reporting requirements. The implementation of MRV requirements under the Soil and Forest Monitoring Law, as well as the harmonization of MRV approaches initiated by the CRCF can be expected to facilitate the quantification of the baseline. The quality of LULUCF emissions and removals data is also set to improve as Member States implement requirements of the LULUCF Regulation with respect to the use of geographically-explicit information and the application of Tier 2 and Tier 3 calculation methodologies across different land categories from 2028 and 2030.

The approach for setting the cap should ensure a fair contribution from agriculture, comparable to other sectors. Depending on the scope of emissions covered by an ETS, setting the cap would also require a degree of consensus on the profile of residual agricultural emissions in 2040 and 2050, with respect to the different emission sources.

4.2 Emission reductions and carbon removals scope

The most significant agricultural emission sources should be the primary focus when defining the scope of an agri-food ETS. In 2022, the three categories contributing the largest share of emissions were enteric fermentation (180,8 MtCO2), N2O emissions from agricultural soils (108,2 MtCO2), and manure management (62,2 MtCO2). When accounting for the total emissions associated with agricultural production (i.e. including LULUCF emissions from cropland and grassland), these three sources were responsible for 44,4%, 26,6% and 15,3% of the total emissions, respectively[23].

The next largest emission categories are accounted for as part of the LULUCF inventories, with emissions from cropland and grassland representing 5,3% and 4,8% of the total emissions from agricultural production, respectively. Each of these net emission categories encompass managed mineral soils, which act as a net carbon sink in the EU, and managed organic soils, which are a net emissions source. Agricultural production on organic soils contributes significantly to GHG emissions. For cropland, organic soil emissions account for 31.4 Mt CO2 out of a total net emission of 21.7 Mt CO2. In grassland, organic soils contribute as much as 44.7 Mt CO2, out of a total net balance of 19.5 Mt CO2. Beyond enhancing soil carbon through practices like rewetting organic soils and improved mineral soil management, land managers can increase carbon removals and yield benefits in climate adaptation and biodiversity restoration through strategies such as agroforestry, afforestation, and reforestation.

The direct inclusion of land emissions within the scope of an ETS, especially in the case of an off-farm point of obligation, may add significant complexity to the system given the nature of net CO2 fluxes from land and the resulting need for boundary definition and more advanced MRV. Instead, to enhance the financial incentives for changes in agricultural production, farmers that are outside of the scope of an ETS could receive financial support for transitioning towards mitigation practices by selling certified carbon removal units to actors within the scope of the ETS. The regulated entities could present these units to help meet their obligation to surrender allowances covering their emissions. A similar approach may be taken for emission reductions, where non-obligated farms generate certified emission reduction units, which are subsequently used by the obligated entities for compliance. This approach has the advantage of increasing potential mitigation contributions from on-farm actions for any given policy option by expanding the number of participating farmers engaging in mitigation practices and allowing them to generate additional income under the ETS on a voluntary basis.

The design of an ETS policy which integrates external emission reduction and carbon removal units requires careful design to ensure environmental integrity of the system, with a particular focus on additionality. In the context of carbon removals, issues such as emission reduction deterrence and the equivalence of removals and emissions reductions must be considered. The risks of integrating temporary removals, which could create path dependencies if they enable the continuation of high

[23] Calculated as % of agricultural emissions (CRF 3) and LULUCF emissions from cropland (CRF 4.B) and grassland (CRF 4.C). The total excludes the use of energy in agricultural production.

GHG-intensive production, especially concerning long-lived gases such as N2O, should be carefully managed.

Several design options can be envisaged to create incentives for the delivery of certified carbon removals or emission reductions, either by creating a direct link between the obligated and non-obligated actors (where compliance entities can purchase units directly from CRCF operators to fulfil part of their compliance obligation) or indirectly (where a public authority acts as a central buyer of units).

Direct link

Where a direct link is established between the compliance entities and the farmers generating CRCF units, the latter can sell the certified units directly to compliance entities under the ETS, without any participation from the regulator or other centralised institutions in the transaction.

The regulator has the possibility to manage the influx of certified units into the system through quantitative restrictions (e.g., by setting a ceiling on the number of units that can be surrendered by a compliance entity) and qualitative restrictions (by defining the eligible types of actors or activities). For instance, a downstream ETS covering emissions from livestock could allow participants to purchase soil emission reduction units generated from peatland rewetting only and surrender those units instead of allowances to specifically incentivize this mitigation mechanism. Other options could be envisioned for the incentivisation of carbon removals, for example, the integration of CRCF units generated through the implementation of agroforestry practices into an on-farm ETS focusing on livestock or fertiliser emissions. In terms of integrating CRCF units representing non-CO2 emission reductions, the decisions surrounding potential design need to take into consideration risks of double-counting and, at minimum, avoid an overlap between the types of actors and emissions scope of the ETS.

For any type of units allowed into the system, an adjustment within the system would need to be considered to ensure that the additional mitigation at the farm level also translates into EU-level mitigation. Introducing certified units without any adjustment could risk weakening the carbon price and mitigation incentive, making the market more volatile. The adjustment could involve maintaining the cap but removing or deducting an allowance from auction whenever an eligible unit is introduced to the system (e.g., if certified units equivalent to 10 million CO2eq entered the market, the total amount of auctioned allowances would be reduced by 10 million). Another option would be to set a new, lower cap based on the expected supply of units in the market, although this may be difficult to predict. This uncertainty could be addressed to some degree by creating very tight supply controls, which may gradually increase depending on observed market trends. The design of such an ETS, accounting for an influx of certified units – whether carbon removal or emission reduction-based – would also need to consider the potential implications of the temporary nature of the certified units and their impact on system stability.

The direct link model may face significant limitations in terms of incentivization. It primarily motivates CRCF operators to undertake mitigation activities only when the combined cost of these activities, along with transaction and certification expenses, is lower than the carbon price in the compliance market. Additionally, the complexity of the market is likely to result in relatively high transaction costs, as participants would need to secure buyers for CRCF units, navigate fluctuating prices, and comply with potential restrictions

Indirect link

In an indirect model, a public institution at the EU level would serve as the sole purchaser of certified units, acting as an intermediary between compliance entities and credit-generating farms. This concept has been explored within the framework of the EU ETS through the idea of an EU Carbon Central Bank. In this model, the bank would convert certified units into allowances, making them available to compliance entities either through free allocation or auction. The funding for purchasing these certified units would be sourced from the revenue generated by selling allowances within the agri-food ETS.

The bank would have direct control over quality and quantity concerns, setting eligibility rules to determine the types of removal providers, approved removal actions, and the volume of purchases. Additionally, the bank could apply discount factors to carbon removal units or use buffer pools to mitigate reversal risks, where not already addressed through the CRCF process. CRCF unit purchases could be organized using approaches such as competitive bidding, with financing potentially provided by public budgets or ETS revenues, as described in section 2.3.3. This approach allows a government-level agency to play a key role in ensuring that farmers receive a fair price for the climate mitigation benefits they generate. It also helps to establish a market for specific types of removals or emission reductions before the carbon price within the ETS reaches to a sufficiently high level to incentivize obligated actors to purchase certified units. For instance, the central bank could buy units from farmers through forward contracts and later auction them to food processors. Such a system could help stabilize carbon prices and sustain a market for CRCF units, while managing the risk of mitigation deterrence, especially as the ETS matures.

Introducing an intermediary between farmers generating certified units and compliance entities within an ETS opens up the possibility of creating distinct markets for decarbonization efforts and for existing commercial relationships related to sourcing agricultural products. In this arrangement, the obligation of an upstream or downstream entity subject to the ETS would be decoupled from the activities of its suppliers, with a standardized emission factor applied in all cases. This means that regulated actors could still pursue various mitigation strategies, such as adjusting their product portfolios, but the climate impact of a supplier's activities would not influence the emissions attributed to them. Instead, carbon removal or emission reduction units could be purchased from a centralized institution, such as a carbon central bank or another government entity, insulating farmers from value chain pressure to some degree. This approach could decrease the complexity of implementing an ETS where the point of obligation is several steps removed from the farmer. By eliminating direct exchanges between the obligated companies and credit generating farms, the system would simplify accounting issues and strengthen safeguards against double-counting.

No link

One of the benefits of an emissions trading instrument is its ability to generate revenues, which can be used to strengthen its effectiveness or address possible negative side-effects. In a no-link model, where incentivizing additional farm mitigation is prioritized, ETS revenue can directly fund specific emission reduction or carbon removal projects, without creating tradable allowances and feeding them into the system. The amount of revenue generated will depend on the carbon price and the proportion of allowances auctioned.

When considering the use of ETS revenues, other objectives may also take priority. Auction revenues could be allocated to support sectoral innovation, finance other ecosystem services such as biodiversity, and promote equitable outcomes both across Member States and among affected social groups, ensuring a just transition. Other possible avenues for the use of ETS revenues will be discussed in more detail in the upcoming workshops.

4.3 Flexibilities and carbon price management

The design of an ETS involves several design choices that influence the efficiency and burden associated with the system, particularly at its start, as well as its ongoing management, including with respect to the carbon price. This can include a temporary increase in the supply of allowance to ensure market liquidity and maintain a lower price at the start. The front-loading of allowances planned for the introduction of EU ETS 2 demonstrates a possible application of this approach, with auction volumes planned to be 30% higher in the first year of the operation of the ETS (2027) than the total number of allowances for that year (i.e. 130% of the cap). The frontloaded allowances will be subsequently deducted from auctioning volumes in the following years.

There are also other price management solutions that may be used to introduce more certainty or stabilize the allowance price in an ETS. The Market Stability Reserve (MSR), introduced under the EU ETS to address excess allowances, is a notable example. If the total number of allowances in circulation exceeds a pre-defined threshold, a percentage of those allowances are removed from the market and placed in a reserve. Conversely, if the total number of allowances in circulation falls below a certain level, additional allowances are released from the reserve to be auctioned. While the MSR assumes supply interventions based on the quantity of allowances, a minimum carbon price could potentially also be enforced through setting an auction reserve price. For example, when the market price falls below the reserve price, a portion of allowances auctioned at the reserve price will remain unsold. The function currently fulfilled by the MSR could be integrated within the role of a central carbon bank, if such an institution was created with a broad mandate to manage the quality and quantity of allowances or CRCF units in the system. The bank could procure carbon removal units upfront and build a dedicated reserve of these units. It could then release those into the EU ETS when carbon prices exceed a certain trigger, thereby increasing the supply of emission allowances on the market to ease carbon prices, without increasing the overall emissions cap under the ETS.

A widely debated mechanism for providing transitional assistance to ETS participants is free allocation, used in the EU ETS. It involves distributing part of the allowances released each year into the system to predefined types of participants free of charge, rather than selling them through auction. Free allocation can help participants adjust to the implementation of an ETS by lowering their costs. However, it can also weaken the incentive to reduce emissions in a timely manner, reduce the efficiency of the carbon market, and limit the revenue that can be used for other objectives. The lead time between announcing a policy involving free allocation and its implementation must also be carefully considered, as there is a risk of creating perverse incentives for regulated entities to postpone emissions reductions to receive a more favorable allocation.

One possible alternative to free allocation is the phase-in approach adopted for including the maritime transport sector in the EU ETS. The provisions set out during the recent revision of the EU ETS require shipping companies to pay for 40% of their emissions in 2024, 70% in 2025, and 100% in subsequent years. This approach ensures a smooth transition for the newly included sector without introducing free allocation.

4.4 Monitoring, reporting and verification

A key challenge that requires addressing when implementing an ETS relates to the MRV of emissions and removals. While an agri-food ETS system could operate based on throughput amounts and basic standard emission factors alone, this approach would not create incentives for on-farm changes in practices. Incentivizing on-farm mitigation requires, at the very least, the provision of some activity data at the farm level.

To balance integrity with cost-effectiveness, two approaches are proposed that can be combined in practice. The first approach is the *default method*, which applies as a starting point for all regulated entities and relies on a minimum number of data points that are already universally collected and held for compliance reasons by public authorities. This could include information reported by farmers under the Integrated Administration and Control System (IACS) to receive payments under the CAP and livestock data held under the Animal Health Law. Depending on the scope of emissions covered, the data available to public authorities may need to be supplemented by data collected from third parties, such as fertilizer suppliers. However, in countries where the efficiency of nitrogen utilization is monitored through nitrogen balances, this data may already be available[24]. Assuming that the aforementioned data can be made available for the purposes of ETS establishment and management, emission factors can subsequently be applied based on livestock numbers and fertilizer inputs. The MRV under the default method would be relatively simple, with reporting and verification focused on a limited number of activity-related data points.

The second approach is the *certified method*. Under this approach, farms would have the option to opt out of the default calculation by volunteering for a more detailed, farm-level calculation of net emissions at their own expense. This would involve verification by a third-party assessor using certification methodologies approved by the Commission under the CRCF. Certified emissions calculations would reflect climate-friendly management techniques that the default calculation might overlook and would detail how the farm's emissions differed from those implied by the default calculation. In addition, this approach should guarantee the delivery of biodiversity co-benefits, which must be demonstrated by any carbon farming activity certified in line with the CRCF.

In an ETS designed to allow for the influx of certified units generated outside of the system scope, ensuring additionality is crucial. Therefore, the reductions or removals represented by the credits released into the ETS must be calculated relative to an activity-specific baseline to guarantee accurate representation of the associated real-world GHG emission reduction or removal. While the use of standardized baselines for generating CRCF units can effectively reward early movers, it may become problematic when it comes to robustly evidencing emission reductions under a compliance system. A standardized baseline inherently involves a number of producers operating at lower intensities than the baseline. Certifying this discrepancy acknowledges performance above the average/standard but does not equate to verifiable emission reductions necessary to demonstrate compliance with overall sector emissions caps.

It should be noted that climate balancing at the farm level is already being practiced today, and there are calculation standards for individual farm climate balances available, although harmonization and consistent rollout are lacking in the EU. Farm operators are also experiencing pressure from both food retailers and the industry to provide climate-relevant information[25], and this trend is likely to grow stronger as more companies start reporting under the CSRD. It's important that the design of the MRV system considers these developments from the start, especially when imposing a default approach on entities that are engaging in sophisticated data collection from their supply chains. The system should ensure the best possible integrated approach linking data in the corporate sector, within compliance systems, and in national inventories. By providing harmonized MRV rules, the CRCF can facilitate this process while minimizing the burden and allowing some flexibility for operators in how they navigate the related protocols.

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[24] https://www.ecologic.eu/sites/default/files/project/2024/60028-EU2040-Sector-Paper-agriculture.pdf

[25] https://literatur.thuenen.de/digbib_extern/dn065565.pdf

4.5 Point of obligation and de minimis thresholds

When defining the overall scope of an agri-food Emissions Trading System (ETS), a range of policy configurations can be considered, with various options available regarding the point of obligation and inclusion thresholds.

An initial discussion of the possible mitigation impact pathways related to some of the points of obligation discussed below can be found in section 3.1.2. The following section delves deeper into different ETS design options, exploring potential thresholds and emission scopes depending on the chosen point of obligation.

Each option suggests sources of emissions that could be covered under specific points of obligation. These suggestions are tentative, considering the ease of monitoring, reporting, and verification, as well as the types of emissions that can be influenced by the particular actors involved. The "potential emissions coverage" provided is indicative of the source's overall significance but does not necessarily reflect the actual potential for absolute emissions reductions within an ETS. The actual reduction potential will likely be lower, with the discrepancy depending on the profile of residual emissions at a given level of EU agricultural production and the mitigation options available to individual actors.

As outlined in section 4.2, each of the proposed options for the point of obligation can be designed to encourage land-based removals and emission reductions. This can be achieved by stimulating demand through mechanisms that integrate externally generated units into the system or through public purchasing programs supported by ETS revenue. These approaches effectively broaden the range of mitigation activities available under each option.

Each section also addresses the issue of *de minimis* thresholds, which can help reduce compliance costs for smaller entities and lower the administrative burden and complexity of operating an ETS. This is highly relevant given the prevalence of small and medium enterprises in agriculture and the food processing industry, with agriculture alone representing almost a fourth of all SMEs operating in the EU[26]. The de minimis thresholds could be gradually lowered over time, allowing a larger number of entities to participate as the system matures, with corresponding adjustments to the cap. Additionally, the design of an ETS could include provisions for voluntary participation, enabling operators or companies to opt into the system.

4.5.1 Manufacturers and importers of synthetic fertilizer

As demonstrated in the case of ETS II, the point of obligation in a cap-and-trade system can be set at a stage of the value chain which is upstream from where the targeted emissions occur. Such an option in an agri-food context could involve imposing an obligation on fertilizer manufacturers.

Upstream actors could be obligated to surrender allowances corresponding to the amount of GHG emissions caused by their product when consumed; in this case, N_2O emissions stemming from the application of manufactured nitrogen fertiliser and CO_2 emissions from applying manufactured urea. Fertiliser producers' scope 1 emissions, emitted during manufacturing, are already covered by the existing EU ETS and therefore outside of the scope of this option.

Table 2. Potential activity/GHG emissions scope of an upstream ETS (fertiliser manufacturers)

GHG Source/ Activity	GHG			Potential emissions coverage (2022)	% of total agricultural
	CH_4	N_2O	CO_2		

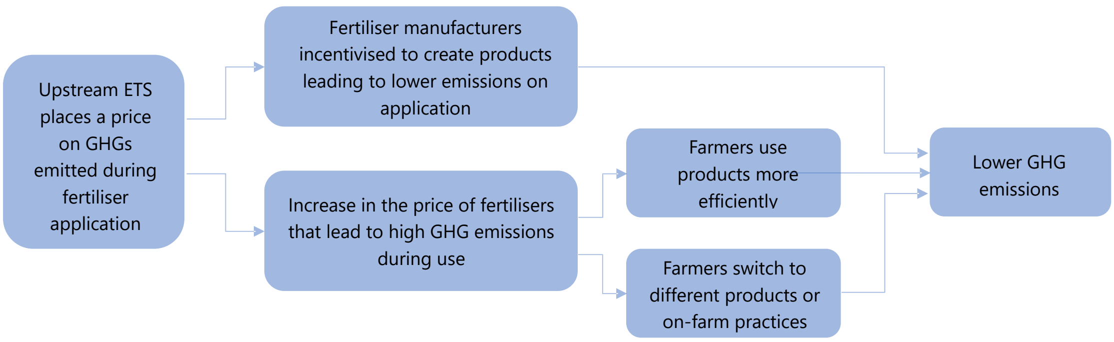
[26] The specific impacts on SMEs in the affected industries will be further discussed in the subsequent papers.

					emissions[27] (2022)
N_2O emissions from managed agricultural soils		✓		Up to 108.2 $MtCO_2e$	26,6%
Urea application			✓	Up to 3.1 $MtCO_2e$	0,8%
Other carbon-containing fertilisers			✓	Up to 0.7 $MtCO_2e$	0,2%
				Up to 112 $MtCO_2e$	27,5%

Placing the point of obligation at the EU market entry could reduce on-farm GHG emissions through two primary mechanisms illustrated in Figure 2:

- Upstream incentives: An upstream ETS could motivate EU manufacturers to shift production towards products with lower on-farm emissions or to develop such products. Increased costs for products associated with higher on-farm emissions would make them less competitive compared to lower-emission alternatives. Similarly, importers might prioritize sourcing products associated with lower on-farm emissions to mitigate costs.
- Downstream impacts: Upstream entities may pass increased costs onto farmers, prompting them to optimize product usage, switch to less polluting options, or explore yield-enhancing strategies. To effectively incentivize low-emission product adoption, the ETS must create a sufficiently strong price differential between high and low-emission products.

Figure 2. Mitigation impact pathways under the upstream ETS (fertiliser manufacturers)



Potential number of regulated entities and thresholds for inclusion

Up to 1,509 companies across the EU, as identified by NACE code 20.15 (Manufacture of fertilizers and nitrogen compounds), could potentially be included in the scheme.

The relatively small number of potential obligated entities suggests a manageable administrative burden. However, determining the rationale for a de minimis exemption based on potential presence of small producers with marginal impact on emissions is complicated by data limitations. While public data on fertilizer manufacturers' production capacity and size is insufficient, an analysis of the broader NACE 20.1 category provides a preliminary overview. It's essential to note that only 19% of companies

[27] Calculated as % of agricultural emissions (CRF 3) and LULUCF emissions from cropland (CRF 4.B) and grassland (CRF 4.C).

within NACE 20.1 operate specifically in fertilizer production (NACE 20.15), limiting the representativeness of this data for our purposes. Nonetheless, this information can serve as a starting point for considering the potential impact of a de minimis threshold.

Table 3. Share of enterprises reporting under NACE 20.1 and their share of total turnover of the NACE code for the EU in 2020, by company size

	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms [20.1]		
	Number of enterprises	% of enterprises	% of total industry turnover
0 to 9 persons employed	5.471,00	68%	1%
10 to 19 persons employed	821,00	10%	1%
20 to 49 persons employed	793,00	10%	3%
50 to 249 persons employed	854,00	11%	16%
250 persons employed or more	341,00	4%	79%
Total:	8.000,00		

Given that the majority of turnover is concentrated in companies with over 250 employees, exempting smaller companies through a de minimis threshold may have a minimal impact on the system's environmental effectiveness. This potential exemption warrants further evaluation in the context of an upstream ETS for fertiliser producers.

Potential challenges and other considerations

Imposing an obligation on manufacturers of synthetic fertilizer leaves emissions associated with the application of organic fertilizer out of scope. Organic fertilisers are overwhelmingly composed of collected manure,[28] and only a very small proportion of organic fertiliser consumed on farms are

[28] About 315 million tonnes of manure is applied to soils annually in the EU compared to about 47.5 million tonnes of compost and digestate. Moreover, out of the total of compost, part is manufactured (e.g. turned into granules) whereas part is produced on-farm. Sources: https://www.researchgate.net/publication/354449584_Manure_management_and_soil_biodiversity_Towards_more_sustainable_food_systems_in_the_EU ; https://www.compostnetwork.info/policy/biowaste-in-europe/

manufactured by upstream suppliers.[29] The application of organic fertiliser is generally associated with lower emission factors which means that, in some circumstances, a potential switch from synthetic to organic fertiliser may constitute a desired effect. A potential ETS fertiliser policy must be carefully designed to avoid unintended effects associated with an increase of unsustainable and inefficient use for organic fertiliser caused by a shift in demand. However, there is also an opportunity to create synergies with the Nitrates Directive, which sets an upper limit on the annual application of manure nitrogen. Under the Directive, Member States are required to establish action programs to be implemented by farmers in Nitrate Vulnerable Zones, which include limiting both organic and mineral fertiliser application.

Separately, the design of an agri-food ETS should, to the extent possible, incentivise mitigation through a change in on-farm practices. This is to a large degree facilitated by detailed MRV on the context of fertiliser application (e.g. timing, weather conditions at the time of use etc.). Capturing those aspects would require more granular data collection on the part of fertiliser suppliers. Given that demonstrating and incentivising more efficient fertiliser use would effectively reduce sales for obligated parties, it may weaken incentives for fertiliser manufacturers to conduct MRV of on-farm practices. On the other hand, the current inclusion of fertiliser manufacturers in the EU ETS is driving a gradual shift towards more costly green fertilisers, which could strengthen the case for adopting more efficient fertiliser use.

There is also a risk that the ETS price signal may be distorted as it passes through the supply chain to farmers. To mitigate this, transparently displaying the ETS cost component in product pricing could be considered.

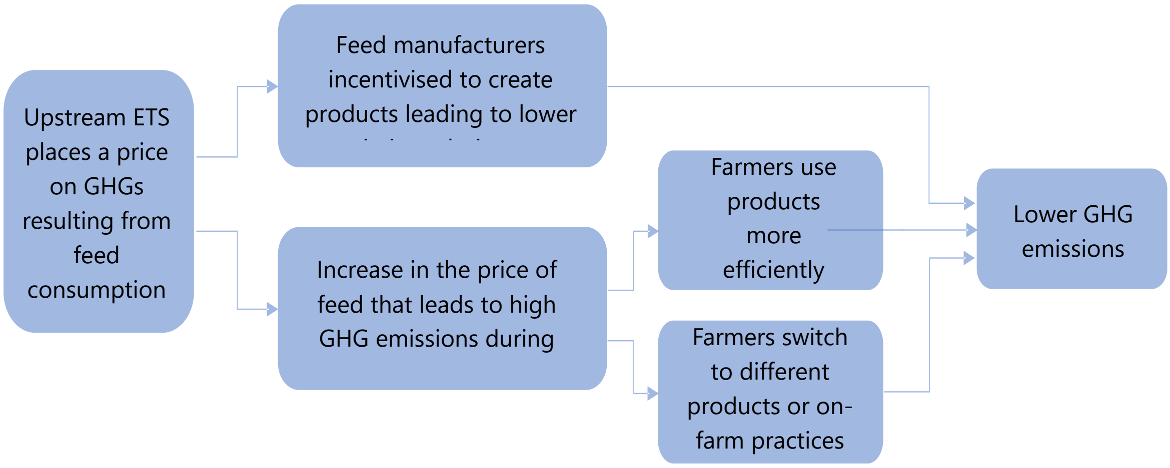
4.5.2 Animal feed producers and importers

Animal feed producers and importers occupy a unique position within the agri-food value chain, acting as both upstream and downstream actors relative to on-farm production. The initial study on "Pricing agricultural emissions and rewarding climate action in the agri-food value chain" proposed a policy option that assigned potential obligations to feed producers and importers in their capacity as upstream entities, influencing feed composition and innovation. This approach aimed to stimulate the development of feed additives capable of reducing enteric methane emissions. While this strategy targets a significant source of agricultural emissions, the overall mitigation potential is unclear given the existing uncertainties regarding the mitigation effectiveness and costs of feed additives, which have not yet been applied on a large scale[30]. Alternatively, the price signal generated by the ETS could indirectly incentivize farmers to optimize feeding practices. This mechanism is analogous to the one proposed for fertilizer manufacturers, as below:

[29] Only 1% of nitrogen input comes from organic fertilisers that are not manure. Source: https://agriculture.ec.europa.eu/common-agricultural-policy/agri-food-supply-chain/ensuring-availability-and-affordability-fertilisers_en#fertiliser-production.

[30] 2040 targets impact assessment.

Figure 3. Mitigation impact pathways under the upstream ETS (feed manufacturers)



Alternatively, feed manufacturers and importers could be subject to ETS obligations as purchasers of grain and sileage. Their emissions liability could encompass the emissions embedded in the purchased feed, associated with N2O emitted during the application of nitrogen fertiliser and CO_2 emissions from urea. Depending on the MRV system design and decisions regarding the inclusion of LULUCF GHG fluxes within the agri-food ETS, soil carbon emissions and sequestration associated with feed crop cultivation on mineral and organic soils could also be considered.

Table 4. Potential activity/GHG emissions scope of a downstream ETS (feed manufacturers)

GHG Source/ Activity	**GHG**			**Potential emissions coverage (2022)**	**% of total agricultural emissions (2022)**
	CH_4	**N_2O**	**CO_2**		
N_2O emissions from managed agricultural soils		✓		Up to 108.2 $MtCO_2e$	26,6%
Urea application			✓	Up to 3.1 $MtCO_2e$	0,8%
Other carbon-containing fertilisers			✓	Up to 0.7 $MtCO_2e$	0,2%
				Up to 112 $MtCO_2e$	27,5%

As previously noted, the total emissions coverage will be lower than the figures presented in the table. This discrepancy arises because the scope of the ETS would be confined to emissions from roughly 70% of the EU's Utilized Agricultural Area (UAA) dedicated to feed production[31].

Potential number of regulated entities and thresholds for inclusion

Approximately 3,786 companies across the EU, identified by NACE code 10.91 (farm animal feed production), could potentially be subject to an ETS. Similar to the fertilizer sector, insufficient data limits

[31] No public data was found on what portion of feed is purchased from external suppliers compared to feed cultivated on-farm.

the potential to substantiate a potential de minimis threshold. Eurostat statistics on turnover and enterprise size are only disaggregated to 10.9 Manufacture of prepared animal feeds", which is broader than farm animal feed only. As illustrated in the table below, while not entirely representative, the data indicates a prevalence of small enterprises within NACE 10.9. However, these companies contribute minimally to overall turnover and, by extension, production. Given that most turnover is concentrated in companies with at least 50 employees, a low de minimis threshold could be considered.

Table 5. Share of enterprises reporting under NACE 10.9 and their share of total turnover of the NACE code for the EU in 2020, by company size

	Manufacture of prepared animal feeds [10.9]		
	Number of enterprises	% of enterprises	% of total industry turnover
0 to 9 persons employed	3.777,00	70%	4%
10 to 19 persons employed	554,00	10%	5%
20 to 49 persons employed	591,00	11%	14%
50 to 249 persons employed	403,00	7%	34%
250 persons employed or more	79,00	1%	44%
Total:	5.400,00		

4.5.3 Food processors and importers

Positioning the point of obligation in a downstream agri-food ETS assigns responsibility for farmgate emissions, embedded in agricultural products, to downstream actors who procure, process, and distribute these products throughout the value chain. Given the substantial impact of livestock emissions and the relative ease of estimating these emissions based on food processors' throughput, a downstream approach targeting specifically meat and dairy processors is suggested here. This configuration would encompass direct emissions from enteric fermentation and manure management associated with livestock products.

Table 6. Potential activity/GHG emissions scope of a downstream ETS (food processors)

GHG Source/ Activity	**GHG**			**Potential emissions coverage (2022)**	**% of total agricultural emissions (2022)**
	CH_4	**N_2O**	**CO_2**		
Enteric fermentation	✓			Up to 180.8 $MtCO_2e$	44,4%

Manure management	✓	✓		Up to 62.2 $MtCO_2e$	15,3%
				Up to 243 $MtCO_2e$	59,7%

A downstream ETS option with a focus on meat and dairy processors in theory allows the choice of the point of obligation between different stages of the downstream part of the value chain. This choice is associated with a range of possible outcomes contingent on the type of supply chain, bargaining power, degree of vertical integration, business model, and, consequently, the range of mitigation approaches that are available to the regulated entities. Depending on the selected point of obligation and the MRV approach, this option could incentivize ETS participants to work towards reducing their emissions obligations through a variety of measures, as discussed in section 3.

Potential number of regulated entities and thresholds for inclusion

Approximately 46,000 companies within the EU meat and dairy sectors, as classified by NACE codes 10.1 and 10.5, could potentially be included in this type of a downstream ETS. It is important to note that this figure overestimates the actual number of participants as the codes encompass a broad range of processing activities, including both primary and secondary processing, active in e.g. production of dried, salted or smoked meat.

While not entirely representative, the relevant enterprise data indicates a high concentration of turnover within a relatively small number of companies in both sectors, with this concentration being more pronounced in dairy than in meat. Assuming correlation between turnover and embedded emissions, the significant share of sector turnover captured by companies with over 50 employees (approximately 83% in meat and 91% in dairy) suggests that a de minimis threshold of 50 employees could be considered.

Table 7. Share of enterprises reporting under NACE 10.1 and 10.5 and their share of total turnover of the NACE code for the EU in 2020, by company size

	Processing and preserving of meat and production of meat products [10.1]			**Manufacture of dairy products [10.5]**		
	Number of enterprises	% of enterprises	% of total industry turnover	Number of enterprises	% of enterprises	% of total industry turnover
0 to 9 persons employed	22.235	67%	5%	9.702	77%	3%
10 to 19 persons employed	5.278	16%	4%	1.156	9%	2%
20 to 49 persons employed	3.308	10%	8%	800	6%	4%

50 to 249 persons employed	2.030	6%	23%	643	5%	15%
250 persons employed or more	512	2%	60%	268	2%	76%
Total:	33.364			12.569		

Potential challenges and other considerations

The initial study on "Pricing agricultural emissions and rewarding climate action in the agri-food value chain" proposed focusing on the most upstream processors to limit the number of participants. This approach would involve imposing emission permit requirements on entities directly sourcing inputs from farms, such as slaughterhouses and dairy manufacturers, while exempting downstream processors.

Alternatively, placing the obligation on further downstream food processors closer to consumers could offer administrative advantages at the public authority level due to a smaller number of larger participants and entail placing the price on actors with a high share of agri-food value chain added value. In principle, this option presents relatively more significant challenges in terms of verification, traceability, and defining the scope of obligated entities. This, in turn, could lead to increased complexity in preventing the double-counting of emissions, with processors participating in supply chains of varying lengths and distributing their products to both retailers and other processors potentially within the scope of the same ETS. These challenges may be alleviated by leveraging ongoing efforts made by major food processors to comply with corporate sustainability regulation in the EU as well as on a voluntary basis. Additionally, interim approaches similar to those outlined in section 3 on Mandatory Climate Standards could provide useful solutions.

Regarding the emissions scope, additional options, such as incorporating embedded N_2O emissions into the obligation calculation, could be explored. Nevertheless, this approach would introduce relatively more significant complexities in terms of the related MRV requirements, as establishing standardized emission factors for products other than primary commodities may pose challenges.

4.5.4 Retailers

Retailers occupy the final stage of the agri-food value chain, positioned closest to the consumer, with the widest portfolio of products associated with a broad range of climate impacts. Theoretically, imposing an ETS obligation on retailers, similar to food processors, could involve various approaches to defining emissions scope. However, given the escalating challenges associated with Scope 3 emissions tracking when moving the point of obligation further downstream, focusing on emissions from enteric fermentation and manure management embedded in livestock products sold is suggested here.

Table 8. Potential activity/GHG emissions scope of a downstream ETS (retailers)

GHG Source/ Activity	**GHG**			**Potential emissions coverage (2022)**	**% of total agricultural emissions (2022)**
	CH_4	**N_2O**	**CO_2**		

Enteric fermentation	✓			Up to 180.8 $MtCO_2e$	44,4%
Manure management	✓	✓		Up to 62.2 $MtCO_2e$	15,3%
				Up to 243 $MtCO_2e$	59,7%

Potential number of regulated entities and thresholds for inclusion

The EU food and beverage retail sector is typically dominated by specialized stores such as greengrocers, butchers, fishmongers, bakers, and tobacconists. These types of stores outnumber nonspecialised in-store retailers with food and beverages predominating, such as general grocers and supermarkets. Nevertheless, in terms of value added and employment, non-specialised F&B retailers play a significantly larger role.

The specialised retailers may in some cases cultivate closer relationships with their suppliers and have better value chain visibility in comparison to big non-specialised stores. However, the large degree of fragmentation in the specialised store category, and the modest total turnover of EUR 143.7 million may justify their exclusion from ETS scope.

Table 9. Share of enterprises reporting under NACE 47.2 and their share of total turnover of the NACE code for the EU in 2020, by company size

	Retail sale of food, beverages and tobacco in specialised stores [47.2]		
	Number of enterprises	% of enterprises	% of total industry turnover
0 to 9 persons employed	397.135	95,5%	58%
10 to 19 persons employed	13.439	3,2%	12%
20 to 49 persons employed	4.335	1,0%	9%
50 to 249 persons employed	953	0,2%	7%
250 persons employed or more	122	0,03%	13%
Total:	415.984		

Available Eurostat enterprise data is limited to the broader "Retail sale in non-specialized stores" NACE (47.1) category, providing no disaggregated enterprise-level information for the specific "Retail sale in non-specialized stores with food, beverages or tobacco predominating" (NACE 47.11) sector.

However, even with this limitation, turnover within the non-specialized retail segment is highly concentrated, with just 1,260 enterprises responsible for approximately 70% of the industry total. This concentration suggests that a de minimis threshold of 50 or more employees might be appropriate for further analysis.

Table 10. Share of enterprises reporting under NACE 47.1 and their share of total turnover of the NACE code for the EU in 2020, by company size

	Retail sale in non-specialised stores [47.11]		
	Number of enterprises	% of enterprises	% of total industry turnover
0 to 9 persons employed	426.690	91,0%	7%
10 to 19 persons employed	20.271	4,3%	4%
20 to 49 persons employed	13.243	2,8%	7%
50 to 249 persons employed	7.204	1,5%	13%
250 persons employed or more	1.261	0,3%	70%
Total:	468.669		

Potential challenges and other considerations

Placing the ETS obligations on the furthermost downstream stage of the supply chain presents specific challenges, mostly associated with the fact that retailers are likely to be several steps removed from the actual source of agricultural and land-based emissions within their supply chain. Major retailers manage a large number of suppliers, and the associated complexity of supply chains would entail the need for significant resources for data tracking and engagement where a more granular MRV approach may be preferred or integrated into ETS design. It should be noted that retailers are already making efforts to overcome data collection and traceability challenges, driven in part by the reporting requirements under the CSRD, with examples including using automated online data collection systems or supplier reporting templates[32].

The further down the supply chain the obligation falls, the less direct the connection with farmers becomes, narrowing down the potential for directly incentivising changes in on-farm practices within the obligated entities' supply chains. The provision of activity data may also be accompanied by confidentiality concerns of suppliers. However, selecting retailers as a point of obligation may be particularly effective for implementing an approach like the one described in section 4.2. In this model,

[32] https://brc.org.uk/news/csr/monitor-measure-and-report-supply-chain-scope-3-emissions-new-guide-for-retailers/; https://www.gs1es.org/

retailers' obligations would not be affected by the carbon footprint of their suppliers. Instead, retailers could purchase emission reduction or carbon removal units from a central carbon bank or another intermediary government agency, without a requirement for a direct commercial relationship with the farmer. This would allow for the incentivisation of on-farm mitigation, without placing undue pressure on suppliers, while retaining a wide range of options available to retailers to reduce scope 3 emissions by shaping consumer preferences and demand.

4.5.5 Farm operators

An alternative approach to the models described above is to place the point of obligation directly on farm operators, who are best positioned to implement emission reduction strategies. This model ensures that those responsible for managing emissions have the flexibility and options to effectively decrease their emissions, retain agency over the outcomes, and are able to draw on the possible profit opportunities resulting from ETS participation.

The simplest method for determining the responsible party under an ETS would be to designate the individual receiving CAP payments – referred to as the "active farmer" – as the obligated entity. This approach ensures that the obligation falls on the person most capable of modifying farm practices to achieve climate mitigation. In cases where CAP payments are not received (such as with some intensive livestock operations), the liability should instead fall on the landowner of the relevant facility.

In theory, an on-farm ETS could offer comprehensive coverage of agricultural emission sources, as detailed in the table below. However, in practice, the selection of emission scope is likely to be driven primarily by considerations of efficiency, distribution, and stakeholder acceptance.

Table 11. Potential activity/GHG emissions scope of an on-farm ETS

GHG Source/ Activity	GHG			Potential emissions coverage (2022)	% of total agricultural emissions (2022)
	CH_4	N_2O	CO_2		
Enteric fermentation	✓			Up to 180.8 $MtCO_2e$	46,7%
N_2O emissions from managed agricultural soils		✓		108.2 $MtCO_2e$	27,9%
Manure management	✓	✓		Up to 62.2 $MtCO_2e$	16,1%
Croplands			✓	21.7 $MtCO_2e$	5,6%
Grasslands			✓	19.5 $MtCO_2e$	5,0%
Liming			✓	21.7 $MtCO_2e$	1,5%
Urea application			✓	5.7 $MtCO_2e$	0,8%
Rice farming	✓		✓	3.1 $MtCO_2e$	0,6%
Other agricultural emissions[33]	✓	✓		2.5 $MtCO_2e$	0,4%
Burning crop residues	✓	✓		1.7 $MtCO_2e$	0,2%
Other carbon-containing fertilisers			✓	0.6 $MtCO_2e$	0,2%

[33] For example, emissions associated with storage of digested residues.

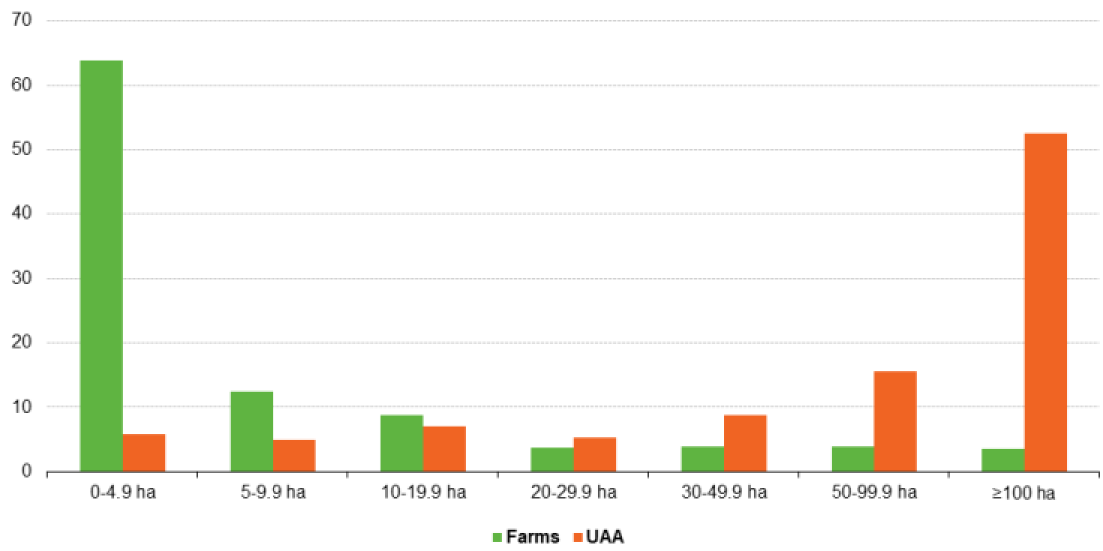
Including carbon soil emissions and removals in the Cropland (4.B) and Grassland (4.C) categories within an on-farm MRV framework is theoretically feasible. However, this would require incorporating direct soil carbon measurements through soil sampling, which differs from most agricultural emissions (CRF 3) typically covered by an ETS, where farm-level data usually consists of activity data at varying levels of granularity. Furthermore, the integration of cropland and grassland categories must address the practical implications of the fungibility of agricultural emissions and LULUCF removals within the system. For a more detailed discussion of the MRV approach, please refer to section 4.1.5.

Potential number of regulated entities and thresholds for inclusion

In the context of an on-farm ETS, the ability of potentially obligated entities to manage compliance is crucial when setting a de minimis threshold for inclusion. For instance, small-scale subsistence farms might face significant challenges due to their limited financial and human resources, which could impact their decision to continue operating. Given the large number of farms in the EU (over 9 million in 2020), enforcing compliance on such a vast scale would be a considerable challenge for regulatory authorities.

To address this, the threshold criteria for on-farm MRV could be based on metrics such as the total land area managed (Utilized Agricultural Area, UAA) and/or the number of livestock units (LSUs). These criteria would help determine which farms fall within the scope of emissions covered by the ETS and ensure that compliance requirements are manageable for different sizes of operations.

Figure 4. Distribution of EU farms and Utilised Agricultural Area (UAA) according to farm size (%)[34]



A significant challenge for implementing an on-farm ETS is the prevalence of small farms across the EU. In 2020, nearly two-thirds of EU farms were less than 5 hectares in size. These small farms are vital not only for food production but also for providing local employment, supporting rural activities, and contributing to community cohesion. They play a crucial role in preserving biodiversity and enhancing the overall resilience of the food system.

To address the challenges posed by the fragmentation of farms, a potential solution could be to enable the grouping of farms, akin to horizontal producer organizations or carbon farming collectives. This approach could help reduce administrative costs and burdens for small-scale farmers. Group auditing

[34] Note: There are some differences in the threshold applied by some Member States, often to exclude the very smallest agricultural holdings which together contribute 2% or less to the total UAA excluding common land, and 2% or less to the total number of farm livestock units.

is a key element under the CRCF, where certification methodologies are anticipated to include simplified auditing rules for groups of operators. This could serve as a useful framework for an on-farm ETS that mandates compliance for larger farms while allowing groups of smaller farms to participate voluntarily. In this system, larger farms could be permitted to purchase units from these groups of smaller farms to meet their compliance obligations.

There is currently no consistent data available on on-farm emissions, so it is unclear how any given threshold would affect the emissions coverage – although this may be relatively easier to approximate for livestock farms, compared to arable farms.

Table 12. Distribution of livestock units across EU farms with live bovine animals and pigs (2020)

	Farms with live bovine animals				**Pig farms**			
	Total Livestock units (LSU)		Holdings		Total Livestock units (LSU)		Holdings	
Over 0 LSU to less than 5 LSU	995.780	**2%**	521.930	**35%**	575.320	**2%**	896.190	**76%**
From 5 to 9.9 LSU	1.234.090	**2%**	197.100	**13%**	202.530	**1%**	76.460	**6%**
From 10 to 14.9 LSU	1.295.920	**2%**	118.120	**8%**	150.880	**0%**	35.580	**3%**
From 15 to 19.9 LSU	1.320.190	**2%**	84.540	**6%**	128.830	**0%**	22.910	**2%**
From 20 to 49.9 LSU	7.526.970	**14%**	256.750	**17%**	589.760	**2%**	57.000	**5%**
From 50 to 99.9 LSU	10.044.060	**18%**	152.330	**10%**	894.110	**3%**	26.550	**2%**
From 100 to 199.9 LSU	14.173.490	**26%**	109.600	**7%**	2.217.660	**7%**	21.760	**2%**
From 200 to 299.9 LSU	6.962.620	**13%**	32.760	**2%**	2.360.300	**7%**	11.900	**1%**
From 300 to 499.9 LSU	5.463.980	**10%**	18.400	**1%**	4.633.710	**14%**	13.870	**1%**
500 LSU or over	6.370.770	**12%**	10.980	**1%**	22.181.720	**65%**	18.820	**2%**

The tables above illustrate the distribution of livestock across pig and cattle farms of varying sizes. Beef cattle and dairy farms are the primary contributors to livestock emissions and thus should be a central focus in decisions regarding the point of obligation for an ETS. Pigs, while producing significantly lower enteric fermentation emissions compared to ruminants, still generate comparable emissions from manure management. Given their lower overall contribution to GHG emissions, poultry could be considered for exemption.

The distribution data suggests that establishing a threshold for pig farms may be relatively straightforward given the high level of concentration of livestock in the biggest farms; with only 3% of farms holding nearly 90% of total pig numbers in the EU. Conversely, determining a threshold for cattle and dairy farms may be more difficult. Setting a threshold of, for example, 100 LSU would cover about 60% of the livestock, which are held by approximately 11% of the largest farms. However, this would result in regulating over 170,000 farms, which is substantial.

Potential challenges and other considerations

A key trade-off in focusing on large farms for emissions regulation is that these farms often exhibit lower emission intensities. In contrast, medium and smaller farms, particularly in Central and Eastern Europe, which might fall outside the scope of an ETS, often engage in less efficient agricultural practices that are associated with higher GHG intensities. Consequently, setting a high inclusion threshold may overlook opportunities to achieve cost-effective emission reductions where they are most economically viable. However, allowing voluntary participation and enabling smaller farms to sell units into the ETS, especially with the support of a government-level intermediary, could help in addressing these challenges and capturing additional emission reduction potential.

4.5.6 Combinations of points of obligation

In an ETS context, a specific stage in the value chain must be solely responsible for any given emission scope to enable a determination of the cap and avoid double-counting. Obligations can be assigned to various types of actors, provided their emission scopes do not overlap. The decision around this could be motivated by any aspects deemed a priority in terms of administrative feasibility, direct incentivization of on-farm practices, and any other specific supply or demand aspects the system is intended to target.

A possible avenue would be to split the two major sources of emissions: livestock and fertilizer use, between two different sets of actors. For example, given the overall need to shift consumer behaviour and optimize meat and dairy consumption, the point of obligation in relation to livestock emissions could be placed closer to the consumer – on the retailer, downstream processors, or large companies in the fast-moving consumer goods industry. Nitrous oxide emissions, on the other hand, could be included in the liability of the fertilizer producers, based on proxy data and leveraging existing EU ETS infrastructure. Alternatively, the largest arable farms could be gradually brought under an agri-food ETS and made responsible for on-farm N2O emissions. This would allow for consistent reflection not only of decreased fertilizer use but also of the effects of more holistic nitrogen management practices. It could build on the rollout of the Farm Sustainability Tool for Nutrients (FaST) – a digital application for farmers currently available for voluntary use under the Common Agricultural Policy.