TRADE POLICY APPROACHES TO AVOID CARBON LEAKAGE IN THE AGRI-FOOD SECTOR

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ACRONYMS

AFOLU	Agriculture, Forestry, and Land Use
CAP	Common Agricultural Policy
CBAM	Carbon Border Adjustment Mechanism
CO_2e	Carbon dioxide equivalent
COP	Conference of the Parties
CTCN	Climate Technology Centre & Network
EBA	Everything But Arms
EFA	Ecological Focus Area
EIT	Economies in Transition
ETS	Emissions Trading Scheme
EU	European Union
FTA	Free Trade Agreement
GAEC	Good Agricultural and Environmental Condition
GATT	General Agreement on Tariffs and Trade
GHG	Greenhouse gas
IPPC	International Plant Protection Convention
LDC	Least Developed Country
LULUCF	Land Use, Land Use Change, and Forestry
MEA	Multilateral Environmental Agreement
MFN	Most Favoured Nation
MRL	Maximum Residue Limit
NDC	Nationally Determined Contribution
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
RED	Renewable Energy Directive
TSD	Trade and Sustainable Development
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Coupled Support
WTO	World Trade Organisation
WWF	World Wildlife Fund

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EXECUTIVE SUMMARY

Emissions leakage or carbon leakage occurs when greenhouse gas (GHG) emissions reduction in a country implementing a climate policy is offset by an increase in emissions in non-implementing countries or in countries with a less ambitious climate policy. Because countries are connected through trade, some emissions leakage will generally be associated with climate policy. The leakage rate is not a fixed number. Among other factors that can affect the leakage rate, it will depend on the emissions intensity of domestic production relative to third countries and its exposure to international competition. Agricultural production would be expected to have a high leakage rate relative to other sectors based on these criteria. A selection of empirical studies reviewed for this study finds that leakage rates arising from climate policy in EU agriculture could lie between -5% and 111% (Annex 2).

At present, there are no EU-wide obligations or regulations imposed on EU farmers requiring the mitigation of greenhouse gases. Emissions reduction is pursued through the Common Agricultural Policy (CAP) as well as national policies through voluntary measures that compensate farmers for any additional costs incurred. More stringent measures may be introduced in future arising from the more ambitious GHG reduction targets set in the European Climate Law adopted in 2021. From a climate policy perspective, it is important to limit the extent of emissions leakage arising from mitigation actions because this undermines their effectiveness. Where leakage occurs through a loss in competitiveness arising from the application of stricter mitigation measures in the implementing country, such that domestic production is replaced by imports that do not face the same measures, there is also a case for intervention to level the playing field.

The EU has a portfolio of measures it can take to limit carbon leakage including both non-trade and trade policy interventions. The focus of this study is on potential trade policy interventions. Five potential trade policy interventions are examined in detail:

- Mechanisms available under multilateral environmental agreements, and particularly the Paris Agreement.
- Tariff-based mechanisms implemented through non-reciprocal preferential trade agreements or voluntary free trade agreements.
- Extending the Carbon Border Adjustment Mechanism to agri-food products.
- Mandatory import standards.
- Mandatory due diligence provisions.

For trade policy measures, consistency with the EU's WTO commitments is an important requirement. Although this study does not go into the legal issues around the WTO consistency or otherwise of the specific trade policy measures, a fundamental and basic requirement is that the measures should not be discriminatory. This means, at a minimum, that measures cannot be applied to imports that do not also apply to EU producers.

MECHANISMS AVAILABLE UNDER MULTILATERAL ENVIRONMENTAL AGREEMENTS

The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) is the primary multilateral agreement dealing with climate stabilisation. In addition to setting agreed goals to stabilise the climate, it establishes several mechanisms and other commitments. The EU contributes substantially to both the Finance Mechanism and the Technology Mechanism, but the extent to which the EU contribution targets agricultural mitigation is not clear. The mechanisms are demand driven and the EU could work to encourage recipient developing countries to give greater priority to reducing agricultural emissions. The EU could also encourage more specific actions in the agriculture and land use sectors in Parties' Nationally Determined

Contributions when these are next updated in 2025. It will also be important to pursue efforts within the Codex Alimentarius Commission to promote sustainability standards for traded food products, including to help address the challenges posed by climate change. The challenge here is to define minimum standards that traded food products should meet to minimise their emissions footprint. This will require considerable preparatory work to define minimum standards that are appropriate and relevant across the globe and which can be enforced by official authorities. These could build on voluntary sustainability standards currently being developed by private actors in the food chain.

TARIFF-BASED MECHANISMS IMPLEMENTED THROUGH NON-RECIPROCAL PREFERENTIAL TRADE AGREEMENTS OR VOLUNTARY FREE TRADE AGREEMENTS

Tariff-based measures use the offer of a more privileged trade relationship with the EU to incentivise greater climate action in partner countries. They leverage preferential access to the EU market in return for commitments to more sustainable development pathways in trading partners, including climate action. To date, it would be hard to identify any positive impact on climate action in third countries arising from the EU's preferential trade arrangements. However, recent initiatives by the Commission will make these provisions more demanding. Ratification of the Paris Agreement will be a requirement for eligibility for Generalised System of Preferences (GSP) preferences for some or all GSP beneficiaries (depending on the outcome of the inter-institutional negotiations underway at the time of writing November 2022). Importantly, if countries fail to implement their notified plan of action, this could be grounds for a complaint of non-compliance. Trade sanctions including the withdrawal of preferences are flagged in the case of Free Trade Agreement (FTA) partners where there are serious violations by the partner country of its Paris Agreement commitments. Future trade agreements with G20 countries will require a common ambition to achieve climate neutrality. These changes will only come into effect over time, and it is too early to say what their practical impact will be. By offering greater preferential access, the EU may incentivise its trading partners to take additional climate action but opening its own market to additional imports may adversely impact the competitiveness of its domestic producers.

EXTENDING THE CARBON BORDER ADJUSTMENT MECHANISM (CBAM) TO AGRI-FOOD PRODUCTS.

At face value, the case for including agri-food products in the CBAM is not a strong one. The CBAM is tied to the EU's Emissions Trading System (ETS) and is being introduced as an alternative to the free allocation of emissions allowances within the ETS to limit carbon leakage. Agriculture is not included in the ETS and neither does it face a carbon price on its emissions. Agriculture could be included in the future in a cap-and-trade scheme to reduce emissions which could open the possibility for discussions on a CBAM for food. Even if this legal hurdle were overcome, there would be major practical problems in determining the appropriate level of embedded emissions in imported food products given the complexity of food supply chains where ingredients can be sourced from several countries all of whom may have climate policies with different levels of ambition. The extent to which application of a CBAM levy can address the loss of competitiveness for EU producers and subsequent carbon leakage if stricter mitigation policies including a price on emissions were implemented would be limited if provision is not made to rebate such a levy on exports.

Imposition of a CBAM levy on imported fertiliser could contribute to carbon leakage in agriculture. If the price of imported fertiliser is increased by a CBAM levy, this will likely be reflected in the domestic price of fertilisers. Fertiliser prices at the time of writing (November 2022) have dramatically escalated over the past year due to the rising cost of natural gas. The CBAM would only be phased in from 2026 or 2027 (depending on the outcome of the inter-institutional negotiations) and it is not clear what market conditions will prevail in four or five years' time. Whether there is a case for further transitional assistance to help farmers adapt to higher fertiliser prices by changing to practices that reduce use of chemical fertiliser will need to be evaluated at that time.

MANDATORY IMPORT STANDARDS

EU agriculture is not currently subject to any EU-wide climate standards. Without identifying a standard that is mandatory for EU producers to apply, there are no grounds to introduce import standards. If, in the future, EU-wide climate standards are defined, applying the same standards to imported foodstuffs could be effective in achieving a level playing field

for EU producers with respect to competition on the EU market. However, its overall impact in reducing carbon leakage and reducing global emissions may be limited. An import standard does not level the playing field for EU exports. There is also the risk that an EU import standard may only redirect higher emission exported products toward those countries with less stringent regulations (referred to as *resource shuffling*). A possible solution would be to accompany the import standard with cooperation agreements with exporting countries to ensure that all their exported products meet the required standards. Such partnership agreements are foreseen as a part of mandatory due diligence measures around deforestation-free supply chains.

MANDATORY SUSTAINABILITY DUE DILIGENCE PROVISIONS

Due diligence initiatives are not a specific trade policy measure but are included here because they may have trade implications. From a climate perspective, the proposed regulation on deforestation-free supply chains is an important initiative. It will set mandatory due diligence rules for operators which place specific commodities on the EU market that are associated with deforestation and forest degradation – soy, beef, palm oil, wood, cocoa and coffee and some derived products, such as leather, chocolate and furniture – though the final list will be decided in the inter-institutional negotiations underway at the time of writing (November 2022). Another important initiative for climate-related action will be the Directive on Corporate Sustainability Due Diligence proposed by the Commission in February 2022. With respect to climate, this Directive will require the large and listed companies covered to adopt a plan to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement. Agriculture and food companies with more than 250 employees on average and with a net worldwide turnover of more than €40 million would be covered by this directive. The significance of this legislation is that it introduces a legal obligation on companies to address the climate impact of their activities. The impact on carbon leakage will be indirect. Companies, such as supermarkets, will have emissions reduction targets which may extend to their Scope 3 emissions thus including primary production. They will source supplies both from domestic producers and from imports. If EU-sourced products have a lower carbon footprint, this will encourage a shift to domestic sourcing in order to fulfil their emissions reduction plans. In any event, companies will have an incentive to invest in reducing the emissions footprint of imported as well as domestic products in order to achieve their reduction targets. A reduction in the emissions intensity of imports in itself will reduce the extent of carbon leakage.

RECOMMENDATIONS

Based on the extended analysis in this report, the following recommendations are put forward regarding the use of trade-related policy instruments to limit carbon leakage in the agricultural sector, assuming that the sector will be required to meet more ambitious mitigation targets in the future than has been the case to date. There are two ways to reduce carbon leakage arising from mitigation action in agriculture. One is to offset any loss of competitiveness for domestic producers by requiring imports to either pay a similar levy or tax that might be levied on domestic producers (the CBAM proposal), or to meet either globally agreed minimum climate-relevant requirements or similar regulatory standards to those imposed on EU producers (import standards). The other is to seek to reduce the emissions intensity of imported products (by encouraging more ambitious climate action in agriculture in third countries, also using the financial and technology transfer mechanisms under the Paris Agreement, by granting tariff preferences in trade agreements, or by strengthening mandatory due diligence requirements). These two approaches can be complementary and are not mutually exclusive. For example, the measures that would restrict imports can also provide an incentive to exporters to reduce the emissions intensity of their exports. Also, measures to reduce the emissions intensity of the exports of trading partners may lead to an increase in their production costs, which would reduce the competitiveness pressure on EU producers.

1. Carbon leakage arises because of differences in the ambition of countries' climate policies. To the extent that other countries 'raise their game' carbon leakage is reduced. **Multilateral initiatives** are important in this respect. The EU should continue to invest in its diplomatic efforts to raise the level of ambition in Parties' Nationally Determined Contributions (NDCs) particularly with respect to mitigation in the agriculture and land sectors. The next COP27 in Egypt in November 2022 is likely to have a particular focus on mitigation in these sectors. The global stocktake under the Paris Agreement currently underway also provides an opportunity to argue

for higher ambition in the next round of NDCs to be proposed in 2025. As carbon leakage arises because of differences in the ambition of climate action across countries, any strengthening of agriculture and land use commitments in NDCs will help to reduce carbon leakage. In future updates to its NDC the EU could introduce specific commitments around reductions in agricultural and food system emissions in addition to its existing commitments around emissions and removals from land use in order to provide the necessary leadership. The EU's credibility in arguing for greater focus on agricultural and land mitigation in other countries will be influenced partly by its domestic action but also by its willingness to support mitigation action particularly in developing countries through the financial and technology transfer mechanisms of the Paris Agreement.

2. The EU has indicated that it wishes to see sustainability standards, including climate standards, included in the work programme of the **Codex Alimentarius Committee**. This will require intensive preparatory work, including on the possible design of minimum standards that would be broadly accepted by the very diverse membership. Resources will need to be allocated to this task.

3. The EU has recently reinforced the way it will use **trade preferences** to incentivise greater climate ambition in its partner countries. As trade agreements are only negotiated or upgraded infrequently, time will need to be given to see whether these strengthened measures will deliver the desired impact. This will require the political willingness to use the stronger instruments when it is justified. Granting additional trade preferences to countries in return for stronger climate commitments may incentivise the EU's trading partners to take additional climate action but opening its own market to additional imports may adversely impact the competitiveness of its domestic producers.

4. **Mandatory corporate sustainability due diligence** is a relatively new instrument with potential trade consequences. It puts the onus on companies to ensure that their activities do not cause adverse impacts on human rights or the environment. Legislation proposed by the Commission will require large and listed companies to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement. Legislation is also proposed that will require operators to ensure that for a group of mainly agricultural forest-risk commodities only deforestation-free and legal products (according to the laws of the country of origin) are placed on the EU market. Both pieces of legislation are under negotiation between the co-legislators at the time of writing (November 2022) and the precise coverage and obligations that will be established are not yet finalised. In the negotiations on the Corporate Sustainability Due Diligence Directive, it will be important to secure that Scope 3 emissions fall within the definition of "a company's operations" because as much as 90% of a company's carbon footprint comes from its Scope 3 emissions. On the assumption that EU production has a lower carbon footprint than imported supplies, enforcement of these obligations will help to minimise carbon leakage.

5. **Mandatory import standards** (sometimes called 'mirror clauses') have been advocated as a way to ensure that imported agri-foods meet the same standards as are required of EU producers. Where standards apply to EU producers (e.g. restrictions on the use of particular pesticides), similar standards could be applied to imports. Conversely, under WTO rules, any requirements that are imposed on imports must, at a minimum, also apply to domestic producers. This limits the scope for import standards specifically relevant to climate policy given that, at the moment, no EU-wide climate standards specific to farmers are in force. Without identifying a standard that is mandatory for EU producers to apply, there are no grounds to introduce import standards. Such standards may be developed in future in response to the greater urgency to reduce emissions introduced by the European Climate Law. However, an import standard cannot avoid carbon leakage if climate policy makes exports more expensive, leading to a loss in global market share. To avoid the risk that an import standard simply redirects higher emission exported products toward those countries with less stringent regulations while compliant exports are sent to the EU, import standards should be accompanied by cooperation agreements with exporting countries to ensure that all their exported products meet the required standards.

6. A **carbon border adjustment (CBAM) levy** on agri-food products would be possible only if the production of agri-food products in the EU were subject to a carbon tax or similar charge such as under a cap-and-trade system. This is not the case at present, so a CBAM for agri-food products is currently not feasible. If agricultural emissions

were subject to a levy in the future, it would open the possibility for a similar levy to be applied on imports. Even if a CBAM levy on imports were legally possible, there would be significant practical issues in applying it to agri-food imports. The experience gained with applying a CBAM levy to the initial group of five industrial products, plus any extension to other products after 2026, will be informative on how easily these administrative and enforcement issues can be overcome. Given the important role of agri-food exports in the EU, a carbon levy on imports alone is unlikely to be effective in preventing carbon leakage. The possibility to rebate any domestic carbon tax or levy if a product is exported is under discussion in the inter-institutional negotiations on CBAM. The outcome will have great significance if agri-food products were covered by such a charge in the future.

7. The inclusion of **fertilisers** in the EU CBAM proposal will lead to an increase in the price of imported fertilisers and thus in the EU market price for fertilisers. As the European Parliament has recognised, it is appropriate that the embedded emissions in using fertiliser should be reflected in its market price. This provides a necessary signal to the industry to seek to reduce emissions and to farmers to look for alternative ways to maintain soil fertility. Fertiliser prices at the time of writing (November 2022) have dramatically escalated over the past year due to the rising cost of natural gas. The CBAM would only be phased in from 2026 or 2027 (depending on the outcome of the inter-institutional negotiations) and it is not clear what market conditions will prevail in four or five years' time. Whether there is a case for further transitional assistance to help farmers adapt to higher fertiliser prices by changing to practices that reduce use of chemical fertiliser will need to be evaluated at that time.

8. If there is resort to trade policy measures to limit carbon leakage in the future, it will be important to take account of the concerns of **developing countries** in the design of these measures. The principle of 'common but differentiated' responsibilities is recognised in the Paris Agreement, meaning that countries are not expected to pursue the same level of climate ambition if they have different capabilities. Trade policy measures to limit carbon leakage should take account of this principle, bearing in mind the WTO principle of non-discrimination. At a minimum, the particular interests of the least developed countries should be considered in the design of trade policy instruments.

9. The impact of the several legislative initiatives to be implemented in the next few years on the level and trend of emissions embedded in agri-food imports into the EU should be monitored. These data are an essential input when attempting to calculate **the trend in EU consumption emissions** as opposed to the territorial emissions reported to the UNFCCC. The main efforts to estimate consumption emissions currently focus on CO_2 emissions only and do not properly account for the GHGs associated with agricultural emissions (CH_4 and N_20) or the CO_2 emissions associated with land use, land use change and forestry. The EU's Joint Research Centre should be encouraged to devote resources to filling this gap.

10. The focus of this report is on bringing about greater coherence between trade and climate policy in mitigating agricultural emissions. However, unilateral trade policy measures may not be feasible or may not be helpful in minimising carbon leakage arising from more ambitious climate action to reduce EU agricultural emissions. **Greater attention should be paid to potentially more effective approaches.** Making available a wider range of mitigation technologies to EU farmers by ramping up research and innovation investment, ensuring a complementary reduction in demand for high-emission agricultural products if climate action leads to reduced production of these products within the EU, and using international diplomacy to encourage more ambitious climate action in third countries and trading partners, can be more successful strategies to minimise carbon leakage in agriculture in the future.

1. INTRODUCTION

THE CONTEXT

Total GHG emissions in EU agriculture[1] in 2020 were 382 $MtCO_2e$, accounting for 12% of the EU total (excluding international aviation and shipping), while the LULUCF sector[2] was a net sink, sequestering 230 $MtCO_2e$.[3] Agricultural emissions have fallen by 21% since 1990, but this fall was concentrated in the first half of the period. Agricultural sector emissions in 2019 and 2020 were at about the same level as in 2005. Projections to 2030 show low emission reductions of 1% in agriculture compared to 2020, with additional policies and measures expected to increase the reduction to 4% (EEA 2021).

The adoption of the European Climate Law in 2021 was a landmark (O.J. 2021a). It set in law that EU-wide greenhouse gas emissions and removals regulated in Union law shall be balanced within the Union at the latest by 2050, thus reducing emissions to net zero by that date, and that the Union shall aim to achieve negative emissions thereafter. Furthermore, it set a binding Union 2030 climate target of a domestic reduction of net greenhouse gas emissions (emissions after deduction of removals) by at least 55% compared to 1990 levels by 2030. The Commission's Roadmap to net zero does not require agricultural emissions to fall to zero (European Commission 2018a) but a significant reduction will be required. It is clear that EU agriculture must greatly increase the level of its climate ambition in the coming decade.

Climate action is one of the ten objectives of the new CAP 2023-2027. Member States are required to define their CAP strategies in the light of a needs assessment and must also take account of EU environmental and climate legislation listed in Annex XIII of the CAP Strategic Plans Regulation (O.J. 2021b). This includes the Effort Sharing Regulation that covers agricultural emissions. Member States' draft Strategic Plans are at the time of writing (November 2022) under approval by the European Commission, and it will be some time before an overall assessment can be made of the additional mitigation potential that will be sought in these Plans. The Commission is not expected to report on the consistency and combined contribution of the interventions in Member State Strategic Plans to achieving environmental and climate-related commitments of the Union until December 2023 (Article 141, O.J. 2021b).

A major concern of the farming industry is that the unilateral implementation of more stringent emissions reduction policies in agriculture may indeed reduce EU agricultural emissions, but if this leads to reduced EU agricultural activity (and assuming that there is no change in demand, which is a strong assumption), then it will result in an equivalent increase in imports. The emissions will simply be relocated abroad if third countries do not implement similar stringent measures. EU territorial emissions will show a decrease, but EU consumption emissions and thus global emissions may be little changed. This is referred to as emissions leakage or simply as carbon leakage. Indeed, if the emissions intensity of imports is higher than for EU production, EU consumption emissions and global emissions could even increase.[4]

OBJECTIVES OF TRADE POLICY MEASURES

Trade policy offers a relevant option for both (a) avoiding carbon leakage and (b) making further contributions to reducing consumption emissions by, for example, helping to limit deforestation in third countries. Several actors, including the European Parliament, have called for greater coherence between trade and climate policy. This report examines the options to bring about this greater

1 These are emissions covered by category 3 Agriculture in the UNFCCC inventory accounting framework. They do not cover energy use in agriculture nor indirect emissions (for example, in manufacture of fertiliser).
2 Emissions from the LULUCF sector are those in category 4 in the UNFCCC accounting framework.
3 European Environment Agency, EEA greenhouse gases - data viewer, accessed 4 July 2022.
4 We will use the terms 'emissions leakage' and 'carbon leakage' interchangeably in this report. Carbon leakage is a widely-understood term and arose in the context of reducing CO_2 emissions in industry. Emissions in agriculture are almost entirely composed of CH_4 and N_20 so 'non-carbon leakage' might be the more appropriate terminology. However, we will continue to use the term 'carbon leakage' in agriculture to refer to the displacement of these non-CO_2 emissions abroad.

coherence specifically in the context of agri-food trade.

Trade policy in this context can pursue different objectives.

- From a producer perspective, the objective is to avoid that EU producers lose competitiveness arising from implementation of a stricter climate regime in the EU compared to its third country competitors. Here, trade policy is seen as a way of levelling the playing field. A closely related political argument is to avoid that the potential negative impacts of higher production costs on domestic producers might lead to a watering down or slower implementation of climate policy within the EU.

- From an environmental perspective, the objective is to avoid that climate policy in the EU simply leads to the displacement of these emissions to third countries, which from a climate perspective brings no benefit. More generally, trade policy might be used to reduce the external climate footprint of EU consumption.

- Also from an environmental perspective, trade policy could encourage other countries to lift their level of climate ambition if access to the EU market were made conditional on meeting minimum climate standards. As exporting countries will often design their production standards to meet the demands of the most stringent export market, in this way EU standards could also become de facto standards for exports to other markets as well.

These policy objectives are clearly interdependent. Import measures designed to protect the competitiveness of EU producers may also be effective in encouraging third countries to up their game. But there are two rather different mechanisms that aim to reduce carbon leakage. The protectionist mechanism seeks to limit carbon leakage by limiting the quantity of imports. The environmental mechanism seeks to limit carbon leakage by lowering the emissions intensity of those imports. The effectiveness of different trade policy instruments in reducing carbon leakage through these two mechanisms is explored in this report.

SCOPE OF THIS REPORT

This report focuses on mitigation actions in the agricultural sector and their potential to give rise to emissions leakage. Changes in land use can also have implications for the level of embedded emissions in imports. For example, promoting afforestation on agricultural land is encouraged as a way to increase the LULUCF net sink and carbon sequestration. But to the extent that afforestation of agricultural land displaces agricultural production, and assuming EU demand remains unchanged, the displaced production will lead to increased imports and a higher level of agricultural emissions in non-EU countries. Bioenergy, whether in the form of dedicated energy crops for biogas, heat or electricity production or in the form of biofuels for transport, is another form of land use with the potential to displace agricultural production for food or feed purposes. Setting land aside for nature also has implications for agricultural production and may well lead to increased non-EU agricultural emissions. However, as clarified in the following chapter, we define emissions leakage solely in the context of a more stringent policy regime for agricultural emissions.

Food industry emissions are also significant. The primary processing sector is tightly tied to the availability of raw materials and thus carbon leakage arising from measures to reduce food industry emissions would not normally be an issue. The secondary food manufacturing sector is more footloose and its competitiveness could be affected by climate policy. However, the impacts of climate policy on the food industry are not covered in this report.

Apart from this Introduction, the report consists of four chapters. The following Chapter 2 discusses the concept of carbon leakage, the factors likely to affect its magnitude, and why it is likely to be a particular problem in the agricultural sector. Chapter 3 examines climate policy and agriculture. It highlights how, until now, climate policy for agriculture has been largely conspicuous by its absence. However, the European Climate Law and the accompanying 'Fit for 55' package of legislative measures could introduce a new era where stricter limits on agricultural emissions are put in place. In this context, the debate around carbon leakage takes on a greater importance.

Chapter 4 is the core of the study. It provides a systematic examination of several trade policy instruments that could be applied in agri-food trade to limit potential future carbon leakage. These measures are discussed in the context of relevant legislative proposals in other sectors with a view to examining the feasibility of extending them to agri-food trade. Finally, in Chapter 5, the findings of the study are summarised and recommendations for further follow up are made.

2.

WHEN IS LEAKAGE A PROBLEM?

DEFINITION OF LEAKAGE

Carbon leakage can be defined as the additional amount of GHG emissions generated in non-implementing countries caused by the implementation of stricter climate policies to reduce GHG emissions in the implementing country or countries.

Leakage expressed as a percentage is calculated as the emissions increase outside the implementing country divided by the emissions decrease in the implementing country. For example, if as a result of climate policy emissions in EU agriculture fall by 10 Mt CO_2e but emissions in non-EU countries increase by 5 Mt CO_2e, then the leakage rate would be 50%. 50% of the reduction in the EU is offset by increases in non-EU countries.

Several implications follow from this definition. First, carbon leakage is associated with differences in the stringency of climate policies between countries. The consequence of the bottom-up approach to mitigation adopted in the Paris Agreement is that explicit or implicit prices for carbon can vary substantially among countries. It is these differences that give rise to carbon leakage.

Emissions due to carbon leakage in non-EU countries are a sub-set of the emissions embedded in EU imports. Arising from the general expansion in international trade in recent decades, the share of carbon emissions associated with traded goods has also increased (WTO 2022; Hong et al. 2022; Chen et al. 2022). There is increasing acceptance that the EU must take responsibility for the emissions attributable to its imports as well as domestic emissions (Sandström et al. 2018). For example, there is increasing focus on the need to limit emissions from deforestation due to imports of palm oil, soy or beef. Carbon leakage refers to the offshoring of emissions that results specifically from international climate policy differences and their impact on trade flows. In practice, trade policy measures to address carbon leakage will often contribute to reducing emissions embedded in international trade more generally. Nonetheless, it is important to keep in mind that these are separate and independent policy objectives.[5] For example, the EU can take steps to minimise its consumption-based emissions attributable to imports without these necessarily being the result of carbon leakage.

A corollary of this definition is that if EU production shifts to competitors that face equal or more stringent climate policy, for example, as the result of a free trade agreement, it is not to be considered as carbon leakage. Such a shift would still have a negative impact on competitiveness and the sector affected, however, it would not be caused by having more stringent climate policy.

Finally, there is the situation where production shifts to a country with a laxer climate policy, but where nonetheless production has a lower emissions intensity than in the EU. Although this is caused by the stricter climate policy, and the increase in emissions in the non-EU country offsets some of the emissions reduction in the EU, some definitions would not consider this to be carbon leakage (HM Treasury 2021).[6] If we focus on consumption-based emissions, a shift to imports with lower emissions reduces consumption-based emissions which is a positive outcome for the climate. For example, tomatoes grown in greenhouses in Northern Europe emit about eight times more CO_2 than those grown under the open sky in a country like Morocco (Xue et al. 2021). If climate policy raised the cost of greenhouse tomatoes this could lead to increased imports from North Africa which would overall lead to a reduction in consumption-based emissions. However, this transfer of emissions abroad would still be counted as carbon leakage in our definition even though it would lead to a reduction in consumption-based and in global emissions.

5 See Sato, M. and Burke, J., What is carbon leakage? Clarifying misconceptions for a better mitigation effort, 8 December 2021, Grantham Research Institute on Climate Change and the Environment.

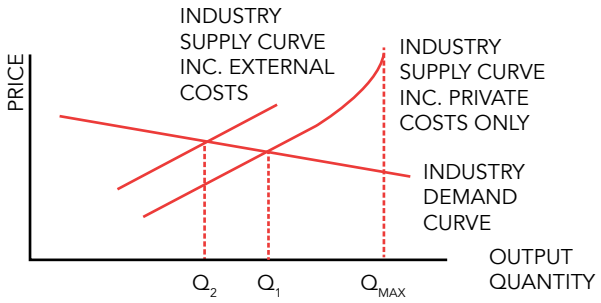
6 This publication defines carbon leakage as occurring if all of the following conditions are satisfied: climate mitigation policies differ across jurisdictions; emissions shift to a region with lower climate mitigation obligations; and the increase in production in that region is associated with a sustained increase in emissions intensity, higher than it would have been had production not moved. The official EU definition of carbon leakage also excludes emissions abroad if that production has a lower emissions intensity than EU production. "Carbon leakage occurs if, for reasons of costs related to climate policies, businesses in certain industry sectors or subsectors were to transfer production to other countries or imports from those countries would replace *equivalent but less GHG emissions intensive products.*" (Recital 8, COM(2021) 564, italics added).

LEAKAGE IN THE PRESENCE OF DISTORTIONS

A further issue that is less well explored in the general carbon leakage literature but which is relevant to the assessment of carbon leakage in agriculture is how to respond to carbon leakage in the presence of existing market distortions. Two market distortions are particularly relevant in agriculture. One is the high level of support given to the production of specific commodities in different countries. The starting point for the existing pattern of international trade is thus not necessarily a level playing field with respect to support levels across countries.[7] How to interpret a shift in emissions resulting from more stringent climate policy if it results in a shift in production from a high-support country to a country with a lower level or zero support for that commodity? For example, voluntary coupled support payments in the EU are used to support and incentivise levels of ruminant livestock production in the EU. Ruminant livestock production is associated with high emissions and the removal of these payments would reduce livestock numbers and thus emissions in the EU. There would be significant carbon leakage – one study estimates overall leakage at around 75% (Jansson et al. 2021). Whether this carbon leakage should be used as an argument in any debate around voluntary coupled support payments depends partly on how we define the level playing field.

Another example of a production distortion is where production in a country does not fully internalise the external costs of that production. For example, in certain regions EU production may be associated with nitrogen losses causing water pollution, ammonia emissions and biodiversity loss in addition to GHG emissions. The social costs of that production are greater than its social benefits, and to achieve the optimal level of production from society's point of view production should be reduced (Figure 1). If then a more stringent climate policy is introduced that, as well as reducing emissions, results in a reduction in production towards that optimal level, are any offsetting emission increases in non-EU countries relevant when evaluating the merits of the policy?

Figure 1. Illustration how taking account of external costs changes the optimal level of agricultural outputs



Source: Own construction.

Our definition of carbon leakage would capture and include the increase in non-EU emissions, but this could lead to perverse policy conclusions. It could lead to the conclusion that production should be maintained or even further increased in the more emissions-efficient country (assumed to be the EU considering the implementation of more stringent climate policies) because this would displace production abroad in less emissions-efficient producers and thus lead to a reduction in global emissions. One criticism of this argument is that, by only focusing on emissions, it ignores the potential damage done in the EU if there are other negative externalities associated with that production. More important, if the objective is to reduce emissions in the non-implementing countries and additional production in the EU requires support, for example, in the form of coupled payments, it is open to question if that funding would not be more effective in reducing emissions in non-EU countries through more direct interventions, for example, through funding technology transfers.

In summary, we propose a simple definition of carbon leakage as the additional amount of GHG emissions generated in non-implementing countries caused by the implementation of stricter climate policies to reduce GHG emissions in the implementing country or countries. However, our examples highlight that how to interpret the policy implications of that carbon leakage can be influenced by the framing and by the specific policy context in which climate policy is introduced.

7 Agricultural support levels by country and commodity are documented in OECD, Agricultural Support Database.

CHANNELS OF LEAKAGE

There are several channels whereby leakage can occur:

- If climate policy increases production costs, this will reduce the competitiveness of domestic production relative to countries without or with a laxer climate policy. Consumers will shift their purchasing to the cheaper imported alternatives. The effect will be that some emissions-producing production will shift to third countries with the laxer climate policy – *the competitiveness channel*. Note that the climate policy may not apply directly to agriculture but to upstream sectors (fertiliser manufacture, energy, fuel) resulting in an increase in input costs that can also have an adverse competitiveness effect.

- If climate policy in a single country reduces consumption of a particular product (for example, through a carbon levy placed on the consumption of that product), this will lower the world market price of that product a little, which will encourage increased consumption in third countries that will offset the reduced consumption in the implementing country – *the demand channel*. (Because this effect is particularly important in the energy sector, it has been called *the fossil fuel channel* in that context).

- Climate policy can have an incentive effect on the willingness of third countries to also increase their mitigation efforts, which may be either negative or positive. There could be a negative incentive effect if more ambitious reduction targets in the EU lead other countries to sit back and take it easier. Or the incentive effect could be positive if other countries are inspired or obliged (for example, by inserting climate clauses in trade agreements) to also increase their level of ambition – *the incentive channel*.

- Finally, carbon leakage can be influenced by technology spillovers. If the EU adopts an ambitious climate target this will incentivise and speed up the development of low- or zero-emissions technologies. Once developed, these technologies can then be used by other countries to reduce their emissions in turn – *the technology spillover channel* (Di Maria and van der Werf 2008; Gerlagh and Kuik 2014). A relevant example is the way subsidies for solar energy in EU countries helped to drive the cost reduction in solar panels that has benefited users in countries everywhere.

THE LEAKAGE RATE IS A VARIABLE NUMBER

Leakage rates will differ across sectors. High leakage rates will be associated with sectors:

- with a higher emissions intensity per euro of output or gross value added because these sectors will experience a greater increase in production costs as a result of climate policy, other things equal;

- which are more exposed to international competition making it easier to substitute domestic production by imports, thus making it more difficult to pass through a higher carbon cost to consumers;

- which have fewer technological options to switch to lower-emissions technologies;

- and where the emissions intensity of production in third countries is higher than for domestic production.

Agriculture fits closely with these criteria and would thus be expected to have a high leakage rate relative to other sectors. It is important to underline that we should not expect to find a unique leakage rate for the agricultural or indeed any other sector. This is confirmed by the wide range of estimates found in the literature attempting to estimate the leakage rate (see Annex 2). The leakage rate will depend on several factors.

The availability of technological and management options to farmers to reduce the emissions intensity of production

The level of emissions in agriculture is the product of two factors: the activity level (level of production) and an emissions factor (the emissions intensity of production). The primary cause of leakage is where climate policy leads to a reduction in production. If farmers only have a limited range of options to reduce the emissions intensity of production, the burden of emissions reduction will fall more on production and the higher will be the leakage rate for any given level of demand. The more technological and management options that farmers have to reduce the emissions intensity of production, the lower will be the leakage rate. Indeed, some mitigation actions are win-win, in that they can both reduce emissions and improve farmers' income.[8] In this situation there is no competitiveness loss and no leakage.

8 The potential of technological and management practices to reduce emissions is often presented in the form of a marginal abatement cost curve, which ranks the scale of abatement achievable at different carbon costs. A feature of these curves is that there is often significant mitigation potential that can be achieved at negative or zero cost.

Leakage rates will vary with the composition of agricultural production

Different agricultural enterprises have different possibilities to make use of technological and management practices to reduce emissions. This implies, using the logic in the previous paragraph, that the same level of climate ambition (e.g. a quantitative target for the reduction in emissions) could result in very different leakage rates across enterprises, because of differences in the share of production changes towards the emissions reduction goal. We can broadly distinguish between crop enterprises, horticulture, intensive livestock and grazing livestock. For example, countries that specialise in grazing livestock may face a higher leakage rate if it is the case that this sector has more limited technological and management options to reduce emissions.

The level of ambition of climate policy

The higher the level of climate ambition, and the larger the reduction in emissions sought within a given time period, the higher the level of leakage. This is because farmers will generally adopt the available technologies and practices to reduce the emissions intensity of production first, and only subsequently reduce production. The greater the emissions reduction sought, the more the reduction will be achieved by reductions in production, and the greater the leakage rate. It follows from the fact that the leakage rate is not fixed but increases with the scale of ambition that the marginal leakage rate (the emissions leakage associated with an additional reduction in domestic emissions) is also increasing and will be higher than the average leakage rate.

The scope of included emissions

The size of carbon leakage will also be a function of the scope of emissions included and where the boundaries are set when making the calculation. At a minimum, the leakage rate will compare the reduction in direct emissions in agriculture to any offsetting increase in direct emissions from agriculture in non-EU countries. Two extensions are possible. One is to include indirect emissions from land use and land use change. In the EU this could include any emissions or removals from alternative land uses if agricultural land is removed from production. For example, if agricultural land is afforested or if there is an increase in agro-forestry, the additional sequestration could be added to any direct reduction in agricultural emissions due to the policy. In non-EU countries, this could include any additional emissions from deforestation due to the expansion of agricultural production to meet the greater export demand. Including emissions changes due to land use and land use change in the leakage rate would, given the potential for deforestation, tend to increase the estimated leakage rate because it would increase the relative emissions intensity of imported products compared to EU production (Golub et al. (2013) estimate that accounting for deforestation-related emissions more than doubles carbon leakage rates in agriculture).

An even wider extension would be to calculate emissions both in the EU and abroad on a life cycle assessment (LCA) basis. This would take into account, not only changes in emissions associated with changes in land use, but also changes in emissions due to changes in embedded emissions in imported feed, use of fertiliser or other inputs. To date, such an LCA database does not exist to allow such comparisons.

The ambition of third country policies

Leakage arises because of differences in the stringency of climate policies across countries. The Paris Agreement has a 'ratcheting up' mechanism built around a Global Stocktake every five years. The expectation is that countries will increase their levels of climate ambition over time. Other things equal, this will reduce leakage rates. This effect is also relevant within the EU for individual Member States. If agricultural emissions were capped by Member State (which could be the *de facto* outcome of the Commission proposal for national targets for the AFOLU sector after 2035, see below), this would reduce the leakage rate for any individual Member State wanting to adopt a more ambitious climate policy.

The size of the implementing coalition

An implication of the previous point is that the size of the implementing coalition matters for the leakage rate. The more countries that commit among themselves to align their climate policies (e.g., by linking their emissions trading schemes or to maintain similar effective carbon prices), the lower the leakage rate will be. For this reason, the leakage rate from climate policy in agriculture will be higher for an individual Member State that introduces rules to limit agricultural emissions than if similar rules were introduced at the EU level.

Leakage affected by the policy instruments used to reduce emissions

The design of mitigation policies can have an important impact on the leakage rate. For example, regulatory approaches impose additional costs on farmers that adversely affect their competitiveness and can lead to carbon leakage. But if farmers are compensated for the additional costs of mitigation actions through subsidies, then carbon leakage will be reduced and, in very particular circumstances, could even turn negative (Pérez Domínguez et al. 2016, see also Annex 2). Other examples revolve around the design of carbon pricing schemes, such as carbon taxes or emission trading schemes. The right to emissions allowances can be grandfathered and thus there is no additional cost to producers for that portion of their production covered by grandfathering, which will reduce leakage. If emissions are reduced by imposing a carbon tax, recycling those tax revenues to producers for investment in emissions-reducing technologies will also reduce leakage.

The existence of accompanying demand measures

The assumption so far has been that if climate policy leads to a reduction in EU production, then imports increase leading to carbon leakage. Often, there is an implicit assumption that the quantity demanded by EU consumers will remain the same. To the extent that reduced EU production will lead to higher prices, some reduction in demand can be anticipated. Climate policy may also be effective in influencing demand by addressing consumer preferences directly (Mattauch et al. 2022). To the extent that price effects operate or complementary measures are introduced that reduce demand, this will reduce the increase in imports and thus leakage.

LEAKAGE RATES AND GLOBAL EMISSIONS

As long as we engage in international trade, there will be leakage associated with climate policy. A reduction in domestic emissions due to climate policy will generally be offset by some increase in emissions in other countries depending on the balance between the four impact channels listed above.[9] Given that climate stabilisation is a global good, what is really important is whether the leakage rate exceeds 100% or not. When the leakage rate exceeds 100%, then climate policy in the EU leads to an increase in global emissions, which is clearly contrary to the climate policy objective. So long as the leakage rate is below 100%, EU climate policy is associated with a reduction in global emissions. However, leakage reduces the cost-effectiveness of EU climate policy in a global perspective, so it is still desirable to reduce leakage to as low a level as possible.

EVIDENCE ON THE IMPORTANCE OF CLIMATE LEAKAGE IN AGRICULTURE

The existence of carbon leakage can be assessed in different ways. This can partly account for different leakage estimates in the literature. *Ex-ante* analyses are carried out using simulation models and designed around hypothetical scenarios. *Ex-post* studies quantify the existence of carbon leakage based on trade flows and embodied GHG emissions. *Ex-ante* studies usually assume a hypothetical climate policy such as the imposition of a quantitative cap on emissions, or the introduction of a uniform tax on emissions, without worrying about the feasibility and practicality of these options. They also often assume the absence of carbon leakage protection mechanisms. However, policy makers have always accompanied carbon pricing mechanisms with special provisions, such as free allowance allocation or carbon tax exemptions, to avoid the risk of carbon leakage. In *ex-post* studies of existing carbon pricing mechanisms, these leakage protection measures are therefore included (European Commission 2021b, 116). The challenge for *ex post* studies is separating out that share of imports that is due to asymmetric climate policies between the trading partners (which contributes to leakage) from imports that are due to the general structural factors that underpin international trade. Because agricultural emissions until now have not been subject to stringent mitigation policies in any country, leakage estimates are all derived from *ex ante* simulation studies and no *ex post* studies exist.[10]

Previous EU focused studies have estimated that emissions leakage related to EU agricultural mitigation policies could vary from -5% to 111% (see Annex 2). These are *ex ante* estimates of leakage assuming the EU were to introduce an explicit carbon tax on

9 For leakage to occur, the impact of the competitiveness and demand channels must be greater than the impact of the incentive and technology spillover channels.
10 As Arvanitopoulos, Garsous, and Agnolucci (2021) note "The risks of carbon leakage associated with climate policies in the agricultural sector remains underresearched".

agricultural emissions or regulations with a similar effect; they are not *ex post* estimates of leakage associated with climate policy to date. The reasons for this variation in the results relate to the assumptions made in the various studies regarding the factors which were identified above as contributing to the size of the leakage rate. Important differences between the studies include the scope of the technological and management practices that are included that give farmers the opportunity to meet reduction targets by reducing the emissions intensity of their production, differences in the ambition of the reductions sought in the scenarios modelled, differences in the policy instruments modelled to achieve these emissions reductions, and differences in data including the future relative emissions intensity of production in EU and non-EU countries. The methodology behind some of the principal studies and their results are described in greater detail in Annex 2.

3.

AGRICULTURE AND EU CLIMATE POLICY

MEASURES TO REDUCE EMISSIONS

We can usefully distinguish five categories of measures with the objective to reduce agricultural emissions:

1. Targeted research and innovation designed to reduce the emissions intensity of production. Much productivity-increasing research can help to reduce the emissions intensity per unit of output by increasing efficiency. However, by lowering costs this also improves the competitiveness of domestic agriculture with the potential for a rebound effect. This occurs when, in parallel with a reduction in the emissions intensity per unit of output, the higher levels of efficiency and profitability lead to an overall expansion in the level of activity such that the absolute level of emissions falls by less and may even increase. Targeted research to develop technologies that specifically aim to reduce emissions cannot completely avoid the risk of this rebound effect but it will be greatly diminished given that these innovations will not necessarily be cost-reducing.

2. Carbon pricing, which seeks to place a price on emissions (including sequestration) either through carbon levies (or payments, in the case of sequestration) or through an emissions trading scheme. Carbon pricing works by sending a price signal to farmers to avoid the production of environmental 'bads' (emissions) while encouraging the production of environmental 'goods' (removals). Production or marketing quotas could seek to mimic the impact of carbon pricing by imposing a similar reduction in production, but the implied incentives to reduce emissions under these policy instruments are very different as would be the associated leakage rates.

3. Regulation is sometimes referred to as the use of 'command and control' instruments in contrast to market-based instruments such as carbon pricing. Regulations impose restrictions on farmer behaviour with a view to achieving desired social objectives. These standards can take different forms. Input standards restrict the use of an input in production, such as limits on the use of antibiotics in animal husbandry. Technology or practice standards mandate farmers to use a particular technology or process, for example, low-emission slurry spreaders or a specific fertiliser such as protected urea. Performance standards impose specific targets on farmers (e.g. to keep nutrient surpluses below a particular level) but leave it up to farmers how those targets are achieved. Regulations implicitly put a carbon price on emissions but are generally considered separately from explicit carbon pricing mechanisms.

4. Inducement or subsidy policies provide an economic incentive to farmers to adopt specific practices or technologies that can help to reduce emissions or increase removals. Subsidy policies work on a voluntary basis, so it is up to individual farmers to decide if the subsidy is sufficient to cover the costs of adoption. For this reason, there is often a strong self-selection bias among those who enrol in these subsidy schemes. Subsidies are often more attractive to more marginal farmers with low-income enterprises where the opportunity cost of adopting the mitigation option may be lower than for intensive farmers.

5. Behavioural change policies involve the use of information, education and knowledge transfer activities to effect emissions-reducing behaviour by farmers (or consumers, see Aleksandrowicz et al., 2016). Such measures are rarely effective on their own, but by improving farmers' understanding of why particular policies are being pursued as well as explaining the options available to farmers to reduce emissions, they can greatly enhance the effectiveness of the other types of policies.

If these mitigation measures raise production costs or reduce production, there is the potential for carbon leakage. As discussed in the previous chapter, depending on the policy instrument and the overall

level of reduction ambition for the sector, the impact on production and the scope for leakage can be smaller or larger.

EXISTING CLIMATE POLICY HAS BEEN LIMITED

EU27 agricultural emissions have fallen by 21% between 1990 and 2020. This fall can be attributed to efficiency-improving technical change that has reduced the emissions intensity per unit of output, regulatory policies under environmental legislation, and incentive (subsidy) policies under the CAP (Alliance Environnment 2019; Blandford and Hassapayannes 2015). To date, climate action per se has played a very limited role. This is despite the fact that climate action has been an explicit objective for the CAP since 2007 when it was first included as an objective for Pillar 2 rural development policy. This is partly because, until recently, there have been no specific targets for the reduction of agricultural emissions either at EU or national levels. Agricultural emissions have been included in the 'effort-sharing' sectors covered by the Effort Sharing Regulation (ESR) where member states have national reduction targets. During the programming period 2014-2020, however, most Member States were able to meet their targets without specifically addressing agricultural emissions under that Regulation.

Environmental legislation addressing other environmental problems such as the Nitrates Directive (91/676/EEC), the Water Framework Directive (2000/60/EC), and the National Emissions Ceiling Directive (2001/81/EC) has been an important driver of emissions reduction in agriculture. Also, successive CAP reforms that shifted support to farmers from market price support, first to coupled payments and then to decoupled payments, lessened the incentive to intensify production and will have contributed to the observed reduction in agricultural emissions. The remaining coupled support payments are largely linked to ruminant animals, which increase emissions (Jansson et al. 2021), with a smaller share linked to protein crops that have the potential to reduce emissions.

Additional mitigation can be achieved by farmers' observance of cross-compliance conditions as an eligibility condition for direct payments. Under cross-compliance, farmers must observe standards of good agricultural and environmental condition (GAECs) as defined by each Member State. Some of these standards (for example, requiring a minimum soil cover, minimum land management to limit erosion, a ban on burning arable stubble to maintain the level of soil organic matter, and retention of landscape features) can prevent erosion and maintain soil organic matter which can help to reduce soil-related emissions.

The 2013 CAP reform introduced a greening payment that allocated 30% of the direct payments budget for 'practices beneficial for the climate and the environment'. Three practices were identified to fulfil this requirement: crop diversification, the maintenance of permanent grassland, and the management of Ecological Focus Areas (EFAs) on arable farms. The permanent grassland ratio is specifically intended to protect soil carbon stores in grasslands, including carbon-rich grasslands in sensitive areas. Climate benefits can also arise from crop diversification if longer rotations lead to an increase in soil organic carbon or if diversification incentivises the cultivation of leguminous crops. EFA areas can include catch crops, nitrogen-fixing crops as well as short-rotation coppices which also can help to reduce emissions. To the extent that these policies supported by direct payments in Pillar 1 of the CAP incentivise climate action, the positive impacts mostly show up in the land sector inventory, with only a limited impact on reducing agricultural emissions of non-CO_2 gases.

Pillar 2 measures support climate mitigation in three ways: by encouraging specific land management practices, through support for capital investments, and through 'soft' measures to improve capacity and uptake through knowledge sharing, training, advisory services, etc. (Alliance Environnment 2019). Several measures can be used to encourage specific land management practices (e.g., zero tillage, soil cover, reversion to grassland, protection of wetlands, afforestation) that can contribute to limiting further warming. Support for investments can be either for productive or non-productive assets. Climate mitigation can be targeted under both types of investments. For example, productive investments could include improvements in animal housing, manure storage, or biomass processing for energy. Non-productive investments could include restoration of wetlands and peatlands. The 'soft' measures supported by Pillar 2 include technical advice, training in agri-environment management, and peer group and co-operative initiatives. Member States are obliged to establish a Farm Advisory System that may provide advice to farmers relating to climate change mitigation and adaptation, biodiversity and protection of water.

EU agriculture has not been directly subject to mitigation policies such as carbon taxes or emissions

trading schemes. Nor have animal numbers or fertiliser use been regulated directly as a climate measure.[11] To date, specific measures to reduce emissions have been voluntary for farmers to implement, with compensation provided under the CAP.

This has been identified as a major reason for the very limited impact of climate measures in agriculture to date. A formal evaluation of the CAP's contribution to climate action concluded that climate action was adequately represented in the objectives of the CAP but that it failed to provide farmers with the tools needed to reduce agricultural emissions (Alliance Environnment 2019). Mandatory elements under the CAP (cross-compliance, greening) have some potential to reduce soil carbon emissions and Member States have the possibility to define relevant but voluntary measures under Pillar 2. However, the evaluation noted that the CAP regulations do not require Member States to offer support for climate action, nor farmers to take up any such offers. A highly critical report by the European Court of Auditors (ECA 2021) noted that the Commission attributed over €100 billion – more than a quarter of the CAP budget – to mitigating and adapting to climate change. It found that most mitigation measures supported by the CAP have a low potential to mitigate climate change, and that it rarely finances measures with high climate mitigation potential. As a result, it concluded that CAP funding has had little impact on agricultural emissions to date.

FUTURE CLIMATE POLICY WILL REQUIRE LARGER REDUCTIONS IN AGRICULTURAL EMISSIONS

This situation will change in the future, for several reasons. The European Climate Law was approved in April 2021 (O.J. 2021a). It sets a 55% net GHG emission target for 2030 (to be complemented by additional removals from the review of the LULUCF Regulation), an EU-wide climate neutrality target for 2050, and the aim to achieve negative emissions thereafter.

Subsequently, the Commission presented a package of proposals to revise its climate, energy and transport legislation under the 'Fit for 55' package in July 2021. 'Fit for 55' refers to the 'at least 55%' net emissions reduction target which the EU has set for 2030. The proposed package aims to bring the EU's climate and energy legislation into line with the 2030 goal. Included in this legislative package was a proposal to revise the effort sharing regulation on Member States' reduction targets in sectors outside the EU Emissions Trading Scheme (ETS), as well as a revision of the regulation on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry (LULUCF).

For the sectors covered by the Effort Sharing Regulation, which include agriculture, the Commission proposes to increase the EU-wide reduction target in 2030 from 29% to at least 40%.[12] This EU target will be allocated to Member States using a per capita income criterion. It would still be left to Member States to design the most effective pathways to meet their individual targets, and there is no specific EU-wide target for agricultural emissions reduction. However, the higher national targets will undoubtedly require a greater effort from the agricultural sector to reduce its emissions in the coming decade.

Extensive revisions are proposed to the LULUCF Regulation to be phased in over successive five-year periods. The LULUCF Regulation is relevant to EU agriculture because it covers changes in soil carbon stocks as well as emissions of non-CO_2 gases not reported in the Agriculture inventory including such activities as soil disturbance, and the drainage and rewetting of mineral and organic soils. According to the Commission's proposal, in the first five-year period 2021-2025, the existing rules would continue to apply. The target for this period would remain the 'no debit' rule, i.e. emissions must be offset by removals in each Member State using the existing LULUCF accounting rules. In the next five-year period 2026-2030, all sources of emissions and removals, including wetlands, would be covered by the 2030 target and would be accounted as reported in the UNFCCC inventories. The target of 225 $MtCO_2e$ of removals, equivalent to the 'no debit' rule when measured using UNFCCC reporting conventions, would be increased to 310 $MtCO_2e$ in order to strengthen the incentive for Member States to prioritise removals. However, only a maximum of 225 $MtCO_2e$ will be allowed to count towards the 2030 net target.

For the third five-year period, the Commission proposes to create a combined Agriculture, Forestry and Land Use (AFOLU) sector with its own specific policy framework covering all emissions and removals of these sectors. The Impact Assessment for the

11 The Dutch government's proposal to limit animal numbers in specific regions in the Netherlands is due to that country's failure to limit its ammonia emissions.
12 The original 2030 target of 30% was set for an EU of 28 countries including the United Kingdom. Following

Communication 'Stepping up Europe's 2030 Climate Ambition' noted that "A policy architecture that combines more explicitly both sectors into one legal instrument may ease designing efficient and effective policies in these sectors and better align them with EU agricultural policy instruments" (European Commission 2020). The Commission proposes that this combined sector should have a target of net zero emissions by 2035, creating net removals thereafter. It proposes to allocate this EU-wide target to individual Member States later in this decade. Compared to the current situation where agricultural emissions are included in the ESR sector, creating an independent AFOLU sector with its own targets would be expected to make more explicit the need for reductions in agricultural emissions after 2030.

However, the Parliament's first reading report took the opposite view.[13] It did not support the merging of agricultural non-CO_2 gases into the LULUCF Regulation, arguing that this could negatively impact efforts, within the agricultural sector, to ensure direct emission reductions. However, it did call for the Union to adopt a reduction target and accompanying binding measures to rapidly reduce methane emissions from all sources, including biogenic sources. On the Council, a majority of countries considered the introduction of post-2030 targets and the creation of the AFOLU pillar in the framework of this revision of the LULUCF Regulation to be premature. Instead, it proposed to include this as part of the review the Commission will be required to undertake following the next Global Stocktake under the Paris Agreement.[14] The inter-institutional trilogues have not been completed at the time of writing (November 2022) but, despite some uncertainties around the outcome, it is clear that there will be much greater focus on reducing agricultural emissions in the years ahead than heretofore.

CARBON FARMING

Carbon farming is defined as a result-based system for carbon removed or emissions avoided. Practices that can help to increase carbon sequestration and reduce emissions include conservation agriculture (no ploughing and reduced tillage); soil cover with cover crops, trees, landscape elements; afforestation; appropriate management of dried peatland (e.g. rewetting, rewetting with paludiculture, higher water table); conversion of arable land to grassland; and grassland management, for instance switching to multi-sward grasslands. The Commission envisages that carbon farming will make an important contribution to reducing emissions from the AFOLU sector in future. For farmers, it offers a potential new source of revenue, either in the form of CAP payments or from private sector actors seeking to offset their emissions. Various pilot projects are currently underway to test the concept.

There are significant challenges before an EU-wide carbon farming scheme can become operational. There are questions around monitoring, verification, additionality, reversibility, satiation, transactions costs and ensuring accounting integrity. The Farm to Fork Strategy proposed that the Commission should come forward with an EU carbon farming initiative before the end of 2021. The Commission responded to this in its Communication 'Sustainable Carbon Cycles' published in December 2021 (European Commission 2021e). So far, this has involved recommendations from the Commission to Member States to promote carbon farming in their CAP Strategic Plans. It is also working on a regulatory framework for certification of carbon removals based on robust and transparent carbon accounting to monitor and verify the authenticity of carbon removals to be announced before the end of 2022.

CLIMATE ACTION IN THE NEW CAP 2023-2027

The new CAP 2023-2027 includes a revised green architecture that is intended to deliver a higher level of environmental and climate ambition than the 2014-2022 CAP. Among the important changes are a new delivery model that gives greater responsibility to Member States to design their own agricultural policy interventions within the framework of common EU rules, the integration of greening payment requirements into conditionality together with some modification of the GAEC standards that farmers should respect in order to be eligible for CAP payments, and the allocation of a minimum 25% of

13 European Parliament, Amendments(1) adopted by the European Parliament on 8 June 2022 on the proposal for a regulation of the European Parliament and of the Council Amending Regulations (EU) 2018/841 as regards the scope, simplifying the compliance rules, setting out the targets of the Member States for 2030 and committing to the collective achievement of climate neutrality by 2035 in the land use, forestry and agriculture sector, and (EU) 2018/1999 as regards improvement in monitoring, reporting, tracking of progress and review (COM(2021)0554 – C9-0320/2021 – 2021/0201(COD), 8 June 2022.

14 Council of the European Union, Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2018/841 as regards the scope, simplifying the compliance rules, setting out the targets of the Member States for 2030 and committing to the collective achievement of climate neutrality by 2035 in the land use, forestry and agriculture sector, and (EU) 2018/1999 as regards improvement in monitoring, reporting, tracking of progress and review - General approach, Document 10677/22, 25 June 2022.

direct payment envelopes to new eco-schemes that should address environmental, climate and animal welfare objectives. The draft Strategic Plans are still under review by the Commission at the time of writing (November 2022) and it is not yet possible to evaluate the potential contribution of the measures included in these Plans to future emissions reductions. Although the Plans must show how they contribute to meeting targets set out in a range of EU environmental legislation, the absence of any EU-wide reduction target for agricultural emissions means that Member States are not obliged to prioritise climate action in their Plans.[15] However, several Member States have individually decided to set reduction targets for agricultural emissions for the coming decade (examples include Belgium, Denmark, France, Germany, Ireland, and Portugal).

IMPLICATIONS FOR CARBON LEAKAGE

Some conclusions relevant to carbon leakage from this review of EU climate policy to reduce agricultural emissions are the following:

- The EU has set more ambitious emissions reduction targets for 2030 and beyond. This will also require larger reductions in agricultural emissions than have been achieved or contemplated until now (recall that even with additional measures the EEA projects 2030 agricultural emissions only to be 4% lower than in 2020).

- A real weakness is that there are no EU-wide targets for the reduction in agricultural emissions, leaving it up to Member States to decide what priority to give to reducing agricultural emissions relative to other sectors under the Effort Sharing Regulation (EU) 2018/842 or its proposed amendment (COM(2021) 555). Several Member States have set national reduction targets for agricultural emissions.

- It is not yet clear whether the CAP Strategic Plans submitted by Member States for approval to the Commission will lead to meaningful improvement in the incentives for farmers to take mitigation action.

- The principal focus of climate policy in agriculture continues to be on the use of subsidy policy by repurposing direct payments to promote, in part, greater climate action. There may also be incidental reductions in emissions arising from stricter implementation of environmental regulations and the targets proposed under the Farm to Fork Strategy (Barreiro-Hurle et al. 2021).

- To date there has been no interest in the use of pricing mechanisms to incentivise reductions in agricultural emissions, although the Commission is taking the first step by proposing payments for removals under the carbon farming initiative. The Commission has proposed that every land manager should have access to verified emission and removal data by 2028 to enable a wide uptake of carbon farming. It has indicated that, following the recommendation by the European Court of Auditors to assess the application of the polluter-pays principle in agriculture, it will carry out a study by December 2023 to assess the potential of applying the polluter-pays principle to GHG emissions from agricultural activities (COM(2021) 800, p. 9). These steps could lead to agriculture being included in the future in some kind of cap-and-trade scheme to reduce emissions which could open the possibility for discussions on a CBAM for food.

- All of these considerations point to carbon leakage in agriculture remaining a relatively limited phenomenon up until 2030. However, the direction of policy causation can also be reversed. The threat of carbon leakage is one reason why the action taken by Member States has been so limited. This makes it all the more important to examine how trade policy measures could address this threat.

15 A very early assessment of what five Member States were planning to do in the climate area together with recommendations was undertaken by a consortium of environmental NGOs in March 2021 (CAN Europe 2021).

4.

TRADE POLICY MEASURES TO ADDRESS CARBON LEAKAGE

The EU has a portfolio of measures it can take to limit carbon leakage in agriculture including both non-trade and trade policy interventions. Non-trade measures include subsidising mitigation measures in agriculture, compensating farmers for indirect emissions costs (e.g., through higher fertiliser prices), the use of carbon labelling, demand side measures to influence consumption, as well as the provision of financial assistance or development aid to partner countries to reduce the emissions intensity of their exports. The focus of this study is on potential trade policy interventions. Five potential trade policy interventions are examined in detail:

- Mechanisms available under multilateral environmental agreements, and particularly the Paris Agreement.
- Tariff-based mechanisms implemented through non-reciprocal preferential trade agreements or voluntary free trade agreements.
- Extending the Carbon Border Adjustment Mechanism to agri-food products.
- Mandatory import standards.
- Mandatory due diligence provisions.

THE WTO INTERFACE BETWEEN TRADE POLICY AND CLIMATE ACTION

Before examining the relevance of specific trade measures to mitigate carbon leakage, it is important to highlight that, given that the EU is a WTO Member, any measures taken will need to take account of the potential trade impact of these measures and their relationship to Members' rights and obligations under WTO rules. Several WTO rules are relevant to measures aimed at mitigating climate change. These include the general non-discrimination principles, GATT Article XX dealing with general exceptions to the WTO rules, national treatment obligations and non-product criteria, and rules around subsidies (Low, Marceau, and Reinaud 2011). The WTO Secretariat notes that "the general approach under WTO rules has been to acknowledge that some degree of trade restriction may be necessary to achieve certain policy objectives as long as a number of carefully crafted conditions are respected".[16]

A formal legal analysis of the WTO consistency of the trade policy measures discussed in this paper is outside the scope of this report. However, as the EU is a strong supporter of multilateral trade rules, it is desirable that measures proposed should be designed to avoid conflict with the EU's WTO obligations.

There has been a particularly intense debate in the international trade law literature around the compatibility of Carbon Border Adjustment Measures (CBAMs) with WTO rules (Pauwelyn and Kleimann 2020). There are two ways to pursue compatibility. Either a country can adopt non-discriminatory harmonising measures to reduce the competitive disadvantage of domestic industries subject to carbon pricing, or alternatively seek to use exemptions in WTO rules to allow potentially justifiable discriminatory measures with coherent environmental objectives.

Under the first approach, the key requirement is for non-discrimination. In the case of indirect taxes, WTO rules permit a country to apply import charges and export rebates not exceeding the level of the indirect domestic tax on 'like' products. This begs the question whether an emissions allowance price set by an emissions trading scheme is indeed an indirect tax or some form of regulation. Similarly, WTO rules allow indirect taxes paid on goods exported to be rebated. Whether this would apply to ETS emission allowances will need to be determined. It would also be important that the method used to determine the carbon

16 WTO, 'Climate change and the potential relevance of WTO rules', accessed 13 July 2022.

content of imported products was objective and non-discriminatory. Giving individual foreign exporters the possibility to show that their emissions are lower than the standard otherwise applied by the importing country could help to improve the legal compatibility of CBAMs. If the exported products are also subject to some form of climate policy that raises their costs, it may be hard to claim that a CBAM is de facto non-discriminatory.

If the CBAM was found to be discriminatory, it could still be possible to find it WTO-consistent if it could be justified by the exemptions provided for environmental (and health) purposes under Article XX. However, the chapeau of this article precludes disguised trade restrictions and arbitrary or unjustifiable discrimination between countries where the "same conditions" prevail. So it would be necessary to ensure that any discrimination implied by the measure was not arbitrary and was not a disguised trade restriction. Rebating a carbon tax on exports has the effect, other things equal, of increasing carbon emissions and might not benefit from the WTO exemption which requires that the measure should benefit the environment. For this reason, some international trade lawyers believe export rebates for ETS-regulated firms would most likely be disqualified as illegal subsidies under WTO law. Rebates may also delay climate efforts within the EU as EU producers could then avoid paying the cost of carbon simply by exporting carbon-intensive products.

As no country has as yet introduced a CBAM there is no WTO jurisprudence on these issues. There remains uncertainty around what exactly would be permissible under current WTO rules. But CBAMs are only one possible trade measure to address carbon leakage. WTO rules may not rule out trade measures to counter carbon leakage provided they are carefully designed. We review the range of options in the remainder of this chapter, highlighting where necessary where issues of WTO compatibility may arise.

MULTILATERAL AGREEMENTS

The potential of multilateral agreements

Multilateral measures refer to raising international standards in bodies such as the Codex Alimentarius Commission or the World Organisation for Animal Health, or negotiating multilateral environmental agreements such as the Paris Agreement or the Stockholm Convention on Persistent Organic Pollutants.

Multilateral Environmental Agreements (MEAs) are an important means for countries to tackle environmental problems, particularly those international or global in scope. There are, currently in force, over 250 MEAs dealing with various environmental issues. About 15 of these MEAs include provisions to control trade in order to prevent damage to the environment.[17] Well-known examples include the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); the International Tropical Timber Agreement (ITTA); the Convention on Biological Diversity (CBD); and the Stockholm Convention on Persistent Organic Pollutants.

The UN Framework Convention on Climate Change (UNFCCC) does not have provisions that directly restrict trade, but it recognises that domestic actions of countries implementing the UNFCCC could have trade implications. Article 3.5 of the UNFCCC states that "The Parties should cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties, thus enabling them better to address the problems of climate change. Measures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade".

Existing international agricultural standards cover food safety (Codex Alimentarius), animal health (World Organisation for Animal Health (OIE)) and plant health (International Plant Protection Convention (IPPC)), but do not directly address the environmental impact of agri-food production.

The Codex Planetarius put forward by the World Wildlife Fund (WWF) proposes a framework that could serve as the basis to develop international environmental standards (Clay 2016). The idea is loosely based on the existing *Codex Alimentarius* established in 1963, which is the internationally recognised set of standards to ensure food is safe and can be traded. It would establish minimum environmental performance levels for countries to enter global markets. Consensus would need to be reached on the standards to be covered, how to measure them, and what levels are acceptable in different geographies and for different foods. The

17 WTO, 'WTO Matrix on Trade-Related Measures Pursuant to Selected Multilateral Environmental Agreements (MEAs)', accessed 13 July 2022.

AGRIFISH Council adopted conclusions in February 2022 that highlighted the EU's commitment to integrate sustainability considerations into the work of the Codex Alimentarius Commission to help address the challenges posed by climate change, biodiversity loss, the spread of antimicrobial resistance, and the increase in non-communicable diseases.[18]

An international agreement that sets high minimum standards and has a credible enforcement mechanism is the gold standard in terms of trade policy. This both raises global standards, avoids the risk that EU consumption leads to unwanted environmental pressures in exporting countries, and ensures a level playing field. The EU is a party to many multilateral environmental agreements.[19] The problem with international agreements is that they tend to the lowest common denominator. Few have a credible enforcement mechanism, and many rely principally on peer pressure. This is particularly the case with the Paris Agreement which is based on a bottom-up approach in which parties make voluntary commitments at a level that they decide themselves. The Nationally Determined Contributions submitted by parties reveal very different levels of climate ambition, even for countries at similar levels of economic development. EU climate objectives go beyond those that have been accepted by other countries to the Paris Agreement. Other measures will then be necessary to avoid carbon leakage arising from these very different levels of climate ambition.

Under the Paris Agreement, countries are responsible for domestic production emissions released within their own borders rather than consumption emissions—the latter would include embodied carbon in imports and exclude embodied carbon in domestic exports. In defining leakage above, a key element is that it arises as a result of differences in the stringency of climate policies across countries. Developing countries have 'differentiated responsibilities' for mitigation under the Paris Agreement, given their lower per capita income and smaller contribution to historical emissions. This implies from the outset that we do not expect climate policy in developing countries to be as stringent or ambitious as climate policy in the EU, and the EU accepted this differentiation when signing up to the Paris Agreement.

When implementing this principle, an important issue is which countries are given developing country status. The UNFCCC divides countries into three main groups according to differing commitments:[20]

- Annex I Parties include the industrialised countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

- Annex II Parties consist of the OECD members of Annex I, but not the EIT Parties. They are required to provide financial resources to enable developing countries to undertake emissions reduction activities under the Convention and to help them adapt to adverse effects of climate change.

- Non-Annex I Parties are mostly developing countries. Certain groups of developing countries are recognised by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Countries classified as least developed by the United Nations are given special consideration.

European farmers will hardly object to the idea that least developed countries or small island states are not expected to make climate commitments as ambitious as the EU, given they are a limited competitive threat. They will be more wary that competitive agricultural exporters might be entitled to make less ambitious climate commitments because they are developing countries, even though their contribution to historical emissions is less than what EU countries have contributed.[21] Nonetheless, the principle of differentiated climate action is accepted and built into the Paris Agreement. Countries are not expected to have similar levels of climate ambition when it comes to mitigation. This principle is obviously relevant when considering trade policy responses to emissions leakage that arises because of these differences in the climate action baseline.

18 Council of the European Union, 'Conclusions on the EU's commitment to an ambitious Codex Alimentarius fit for the challenges of today and tomorrow', 21 February 2022.
19 See the list on this Commission web page 'Multilateral environmental agreements', available at https://ec.europa.eu/environment/international_issues/agreements_en.htm.
20 UNFCCC, Parties and Observers, accessed 3 September 2022.
21 Historical emissions are only available for CO_2 emissions from fossil fuel use. Historical emissions of CO_2 are relevant because the long-lived nature of this gas in the atmosphere mean that emissions in an earlier period are continuing to contribute to global warming. For example, Brazil has contributed 0.96% of cumulative global emissions during the period between 1750 and 2000 compared to 17.1% for the EU27 (Source: Our World in Data, Who has contributed most to global CO_2 emissions? accessed 3 September 2022).

Using multilateral agreements to address carbon leakage

The Paris Agreement under the UNFCCC is the primary multilateral agreement dealing with climate stabilisation. In addition to setting out agreed goals ("Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels" and "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century"), the Agreement establishes several mechanisms. These are:

- A mechanism for cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions (Article 6).
- The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts (Article 8).
- A Financial Mechanism to provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention (Article 9).
- A Technology Mechanism to facilitate technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions (Article 10).
- Support for capacity-building to enhance the capacity and ability of developing country parties to implement adaptation and mitigation actions (Article 11).
- A transparency framework which provides for regular tracking and monitoring of progress on parties' nationally determined contributions, adaption actions, and financial support provided (Article 13).
- A commitment to reviewing the implementation of the Agreement as part of a 'global stocktake' every five years, with the first global stocktake taking place over the period 2021-2023. The outcome of the stocktake should influence the next revision of nationally determined contributions in 2025 where parties have committed to increasing their level of ambition over time (Article 14).

These mechanisms and commitments offer a number of opportunities for the EU to influence the ambition of climate action in other countries, particularly developing countries, and thus to limit the extent of carbon leakage including in the agricultural area. The main opportunity is to help these countries to lower the emissions intensity of their agricultural production and exports. Here the relevant instruments are the Finance Mechanism and the Technology Mechanism. The EU reports every two years on its contribution to global climate finance.[22] With regard to technology transfer, the EU and several Member States support the Climate Technology Centre & Network (CTCN), which is the operational arm of the UNFCCC Technology Mechanism and promotes the accelerated transfer of environmentally sound technologies for low-emission and climate-resilient development at the request of developing countries. What could be better reported is the extent to which EU assistance under these Mechanisms targets mitigation in the agricultural sector. Both mechanisms are demand-driven and depend on the priority that recipient developing countries give to reducing agricultural emissions in their nationally determined strategies.

It is also important that the EU uses the opportunity of the global stocktake to push for ambitious revisions in the next updating of nationally determined contributions (NDCs) in 2025. This should include encouraging more specific actions in the agriculture and land use sectors in Parties' NDCs.[23] A greater focus on agriculture and land use is expected at COP27 in Egypt in November 2022 where it is hoped to achieve a decision on the Koronivia Joint Work on Agriculture. The EU's credibility and ability to influence these negotiations depends partly on the extent of its own ambition in the agriculture and land sector and also on the delivery of its commitments to provide assistance through the Finance and Technology Mechanisms.

22 See the most recent submission to the UNFCCC by Germany and the European Commission on behalf of the European Union and its Member States on information to be provided by Parties in accordance with Article 9, paragraph 5, of the Paris Agreement submitted in November 2020.

23 The CGIAR Climate Change, Agriculture and Food Security initiative maintains a database on how agriculture and land use is reflected in Parties' NDCs submitted in 2020 or shortly afterwards. See also FAO, 2021.

It would also be important to pursue efforts within the Codex Alimentarius Commission to promote sustainability standards for traded food products, including to help address the challenges posted by climate change. The challenge here is to define minimum standards that traded food products should meet to minimise their emissions footprint. This will require considerable preparatory work to help to define minimum standards that are appropriate and relevant across the globe and which can be enforced by official authorities. Such work could build on the growing number of voluntary sustainability standards that have been adopted by private actors such as traders, manufacturers, retailers and service providers (UNFSS 2022).

The EU raised the need to revisit the mandate of Codex in view of the global focus on food systems transformation for sustainable production at the June 2022 meeting of Codex Executive Committee without gaining much support. The official minute recorded that "Different views were expressed on whether it was appropriate to revisit the mandate of Codex, ranging from confirmation that the Codex mandate did not need to be changed to the need for adaptation in view of the global focus on food systems transformation for sustainable production".[24] The New Zealand report of the meeting was more forthright, noting "In discussions around the future of Codex, a point was raised by the one region regarding the possibility of extending the Codex mandate to (in their view) better cover issues such as Sustainability, One Health and antimicrobial resistance (AMR). This view was not well supported."[25] Ultimately, decisions regarding the statutes of Codex including its mandate are the remit of the FAO and WHO governing bodies, but it seems getting sustainability criteria on the CODEX agenda will be an uphill task.

TARIFF-BASED MECHANISMS

Tariff-based mechanisms refer to trade policy instruments that offer lower or zero tariffs on selected imported products on the basis of certain environmental criteria, rewarding countries, in our context, for committing to more ambitious climate action and reducing the emissions-intensity of their exports. The EU currently has two such instruments: a unilateral non-reciprocal grant of preferences under the Generalised System of Preferences, and reciprocal trade concessions offered as part of a free trade agreement with other countries. Their scope to limit carbon leakage in agricultural products is now examined.

The Generalised System of Preferences: applied tariffs conditioned on climate action

One proposed trade policy measure is to apply lower tariffs on imports from countries that agree to enact more ambitious climate mitigation measures, to provide an incentive for exporting countries to raise their game. This would normally be difficult to justify in the light of the non-discrimination requirement under WTO rules. However, those rules contain special provisions which give developed countries the possibility to treat developing countries more favourably than other WTO Members. In particular, the Enabling Clause adopted in 1979 provides the legal basis for the Generalised System of Preferences (GSP) whereby the EU provides more favourable tariff treatment to products originating in developing countries. As raw materials and industrial goods (apart from textiles) entering the EU generally face low Most Favoured Nation (MFN) tariffs, the main benefit of this arrangement arises in the apparel and clothing sector. However, tariff concessions on the import of agricultural and food products are also important.[26]

The EU's GSP consists of three schemes:

- a general arrangement (standard GSP), which provides for tariff reductions on roughly 66% of tariff lines for those developing countries eligible because they have been classified by the World Bank as having low or lower-middle income per capita for at least one of the previous 3 years. A graduation mechanism is in place to remove preferences for particular products where a country has a high share in total imports thus demonstrating its competitiveness in producing and exporting that product.

- a special incentive arrangement for sustainable development and good governance (GSP+) for countries eligible for GSP and which fulfil additional criteria including ratification and implementation of a series of international conventions on human rights, labour rights, the environment and good governance as well as economic vulnerability.

24 Joint FAO/WHO Food Standards Programme Codex Alimentarius Commission, Report of the Eighty Second Session of the Executive Committee of the Codex Alimentarius Commission Virtual, 20-24 and 30 June 2022, REP22/EXEC1.
25 New Zealand Ministry for Primary Industries, Joint FAO/WHO Food Standards Programme Executive Committee Of The Codex Alimentarius Commission (CCEXEC), Report of the 82nd Session Virtual, June 2022.
26 European Commission, GSP Statistics (1 December 2020) presents data on GSP utilisation in 2019.

- a special arrangement for the least developed countries (Everything But Arms, EBA).

The Commission published its proposal for a revision of these GSP schemes in September 2021, to enter into force from 2024 (COM(2021) 579). This proposal maintained the current structure of three schemes but proposed some 'fine-tuning'. Of relevance to this report is that it proposed to add the Paris Agreement to the list of conventions that GSP+ countries would have to sign. Also as something new, the proposal requires that GSP+ countries not only give a commitment to ensure the implementation of these conventions, but this must be accompanied by a plan of action for the effective implementation of the relevant conventions. This requirement will also apply to the Paris Agreement. Although EBA and Standard GSP countries would not be required to ratify and implement these conventions, it proposed that any GSP beneficiary could lose its access to the scheme if it committed serious and systematic violations of the principles of these international conventions.

The European Parliament, in its resolution in March 2019 on the implementation of the GSP Regulation, had previously called for the Paris Agreement to be added to the list of 27 core international conventions that GSP+ beneficiary countries must comply with.[27] The Parliament's INTA Committee report, which was adopted as the Parliament's position for the inter-institutional negotiations on the revision of the GSP Regulation in June 2022, further recommended that all GSP beneficiaries should be required to ratify all of the conventions under the system, including the Paris Agreement, within five years.[28]

As 193 Parties (192 countries and the EU) have already ratified the Paris Agreement as of July 2022, the new obligation requiring ratification is not likely to make much difference. However, if countries fail to implement their notified plan of action, this could be grounds for a complaint of non-compliance. The Commission proposal enhances the monitoring and implementation of GSP+ commitments, for instance through increased transparency and participation of relevant stakeholders, including through the recently created Single Entry Point (SEP) mechanism for non-compliance related complaints. Overall, these commitments could encourage greater awareness and commitment to reducing emissions in line with the Paris Agreement targets among GSP+ countries or all GSP beneficiaries depending on the outcome of the inter-institutional negotiations.

Climate provisions in FTAs

Current FTA climate provisions

Sustainability as an objective of EU trade policy has been reflected in a specific chapter on trade and sustainable development (TSD) in all the EU's bilateral free trade agreements since the EU-Korea FTA in 2011. These include commitments by both parties in areas such as trade, labour standards, climate and environment protection. These TSD chapters aim to maximise the leverage of increased trade and investment to achieve progress on key sustainability issues, such as the promotion of decent work, environmental protection and the fight against climate change.

The most common commitment on climate action within these trade agreements has been for the partners to reaffirm their commitment to the aims of the Paris Agreement. The TSD chapters also often include non-regression clauses, which prohibit either party from weakening, or failing to enforce, their existing environmental laws in a manner affecting trade or investment. Such clauses do not generally say anything about the minimum content of those laws, so the impact of these provisions on carbon leakage will not be great. They do not address the situation where the exporting country has lower standards than the importing country. In some agreements, these provisions are not subject to dispute settlement.

For example, the parties to the EU-Japan FTA signed in 2017 agreed to "reaffirm their commitments to effectively implement the UNFCCC and the Paris Agreement… The Parties shall cooperate to promote the positive contribution of trade to the transition to low greenhouse gas emissions and climate-resilient development. The Parties commit to working together to take actions to address climate change towards achieving the ultimate objective of the UNFCCC and the purpose of the Paris Agreement." The 2019 EU-Vietnam FTA similarly reaffirms "their commitment to reaching the ultimate objective of *the United Nations Framework Convention on Climate Change* of 1992 … and to effectively implementing the UNFCCC, the *Kyoto Protocol to the United Nations Framework Convention On Climate Change*, … and the *Paris Agreement*, done at 12 December 2015, established thereunder and commits the parties to cooperate and share information and experiences in the transition to low greenhouse gas emissions and climate-resilient economies."

27 European Parliament, Implementation of the Generalised Scheme Preferences (GSP) Regulation European Parliament resolution of 14 March 2019 on the implementation of the GSP Regulation (EU) No 978/2012 (2018/2107(INI)).

28 European Parliament, Committee on International Trade, Report on the proposal for a regulation of the European Parliament and of the Council on applying a generalised scheme of tariff preferences and repealing Regulation (EU) No 978/2012 of the European Parliament and of the Council (COM(2021)0579 – C9-0364/2021– 2021/0297(COD)).

Two of the most recent FTAs signed by the EU are with the UK and New Zealand, respectively. These FTAs are with countries that share a high level of climate ambition with the EU. In the New Zealand agreement, the Article on Trade and Climate Change recognises the importance of taking urgent action to combat climate change and its impacts, and the role of trade in pursuing this objective. Each Party commits to effectively implement the UNFCCC and the Paris Agreement, including commitments with regard to Nationally Determined Contributions (which includes the obligation to refrain from any action or omission which materially defeats the object and purpose of the Paris Agreement). This commitment includes the following sub-commitments:

"(a) Promote the mutual supportiveness of trade and climate policies and measures thereby contributing to the transition to a low greenhouse gas emission, resource-efficient and circular economy and to climate-resilient development;

(b) Facilitate the removal of obstacles to trade and investment in goods and services of particular relevance for climate change mitigation and adaptation, such as renewable energy and energy efficient products and services, for instance through addressing tariff and non-tariff barriers or through the adoption of policy frameworks conducive to the deployment of best available technologies;

(c) Promote emissions trading as an effective policy tool for reducing greenhouse gas emissions efficiently and promote environmental integrity in the development of international carbon markets."

The EU-UK Trade and Co-operation Agreement goes further, in that each party in the chapter on a 'Level Playing Field for Open and Fair Competition and Sustainable Development' reaffirms its commitment to achieve economy-wide climate neutrality by 2050. It requires each party to have a system of carbon pricing in place as of 1 January 2021, specifying that it should cover aviation as well as electricity, heat and industry. They shall give serious consideration to linking their respective carbon pricing systems in a way that preserves the integrity of these systems and provides for the possibility to increase their effectiveness.

The non-regression clause is also specified more tightly. In the case of climate targets (and also other environmental targets that are provided for in each party's environmental law at the end of the transition period (i.e. end of 2020), the parties commit not to weaken or reduce these targets, even where the attainment of the targets is envisaged for a date that is subsequent to the end of the transition period. However, as drafted, this clause would prevent environmental regression in the UK only if it affects trade and investment. It also does not require the UK to maintain the same legislation that it has inherited from the EU, only that changes to this legislation should not weaken the overall level of environmental protection in a way that affects trade or investment.

Strengthening climate standards in FTAs

The TSD provisions in existing FTAs have long been seen as weak in terms of their coverage of sustainability issues, the robustness of the dispute settlement and enforcement procedures, and the limited ability of civil society to participate in trade dialogues. In response to these criticisms which came to a head in the negotiation of the EU-Canada FTA, the Commission published a non-paper[29] in 2017 that took stock of the implementation of TSD chapters in EU trade agreements and undertook to consult with civil society on the issue (European Commission 2017). Following a description and an assessment of current practice, that paper put forward possible options for discussion on improving implementation.

In 2018 the Commission published another non-paper setting out "a set of 15 concrete and practicable actions to be taken to revamp the TSD chapters" (European Commission 2018b). It proposed substantive strengthening in three areas: climate change, the substantive scope for civil society, and the resources available to support the implementation of TSD chapters. It also emphasised the role of more assertive enforcement, building on the existing provisions included in these chapters but ruled out moving towards a sanctions-based approach as argued for by some participants in the public debate.

On climate action, the Commission noted that FTAs signed after the Paris Agreement contained stronger and more detailed climate provisions (see examples above). They require the parties to (i) reaffirm a shared commitment to the effective implementation of the Paris Agreement, (ii) commit the parties to close cooperation in the fight against climate change, (iii) and commit the parties to agree on and carry out joint actions. It highlighted the potential for innovative activities that would encourage joint actions also by non-governmental actors.

29 A non-paper means that it has been drawn up by the Commission services but has not been politically approved by the Commission as an institution.

The 2021 Trade Policy Review proposed that "Further actions will be considered in the context of an early review in 2021 of the 15-point action plan on the effective implementation and enforcement of TSD chapters in trade agreements. The review will cover all relevant aspects of TSD implementation and enforcement, including the scope of commitments, monitoring mechanisms, the possibility of sanctions for non-compliance, the essential elements clause as well as the institutional set-up and resources required" (European Commission 2021f). Additional commitments included a proposal to include a chapter on sustainable food systems in future FTAs; that respect of the Paris Agreement would be considered an essential element in future trade and investment agreements and, for G20 countries, should be based on a common ambition to achieve climate neutrality as soon as possible and be properly reflected in NDCs submitted under the Paris Agreement; and that the Chief Trade Enforcement Officer would take a more active role in implementing the sustainability dimension of existing agreements.

An open public consultation on the review of the TSD chapters closed in November 2021.[30] The Commission published a Communication on trade partnerships in June 2022 as its response (European Commission 2022b). Its position is that "trade agreements provide a platform for policy dialogue and cooperation on sustainability with partner countries [which is] vital because only global cooperation can address global challenges". It noted that the TSD chapters in its FTAs require the effective implementation of multilateral agreements including the Paris Agreement. In this Communication, the Commission identified six actions to strengthen the potential role of FTAs in achieving more sustainable trade flows. These are: the need to be more proactive in cooperating with partners; stepping up a targeted and country-specific approach to TSD; mainstreaming sustainability beyond the TSD chapter of trade agreements; increasing monitoring of the implementation of TSD commitments; strengthening the role of civil society; and strengthening enforcement by means of trade sanctions as a measure of last resort.

Specifically on climate action, the Communication now accepts that trade sanctions would be an appropriate means to foster compliance in cases of serious violations of the parties' Paris Agreement commitments. "In the case of the Paris Agreement, the intention would be to capture failure to comply with obligations that materially defeats [sic] the object and purpose of the agreement" (European Commission 2022b, 11). Depending on how this is used in practice, this could enable the EU to carry out a more assertive enforcement of the climate commitments of its trading partners.

Countervailing duties

The notion that countries have the right to protect themselves against unfair trade is well recognised in WTO rules. Countries can resort to trade remedies to protect against imports that are subsidised or dumped (sold below their normal price), or if a rapid rise in imports threatens serious injury to domestic production (safeguard clause), provided certain procedures are followed. Pressure has been growing to add other justifications such as social or environmental dumping to these economic factors justifying the use of trade remedies.

The United States circulated a text for a draft WTO Ministerial Decision on 'Advancing sustainability goals through trade rules to level the playing field'.[31] This would recognise that failure of a government to adopt, maintain, implement and effectively enforce laws and regulations that ensure environmental protections at or above a threshold of fundamental standards shall constitute an actionable subsidy which could trigger countervailing duties by a country adversely affected.

While this text was not agreed at the 12th Ministerial Conference in June 2022 and indeed stands little chance of being adopted in the near future, it does raise an intriguing way in which existing WTO rules could be re-interpreted to allow for greater coherence between trade and climate policies.

Using tariff-based measures to address carbon leakage

Tariff-based measures use the offer of a more privileged trade relationship with the EU to incentivise greater climate action in partner countries. They leverage preferential access to the EU market in return for commitments to more sustainable development pathways in trading partners, including climate action. To date, it would be hard to identify any positive impact on climate action in third countries arising from the EU's preferential trade arrangements. The climate provisions in FTAs have generally not gone beyond reaffirming the parties' commitment to the Paris Agreement but, as this Agreement is designed

30 Commission, Open public consultation on the Trade and Sustainable Development (TSD) Review, completed 5 November 2021.
31 WTO, 2020, Advancing sustainability goals through trade rules to level the playing field, WT/GC/W/814.

as a 'bottom up' agreement where each party decides on the level of commitment it wishes to make, these provisions have had no real practical effect.

Some recent initiatives by the Commission will make these provisions more demanding. Ratification of the Paris Agreement will be a requirement for eligibility for GSP preferences for some or all GSP beneficiaries (depending on the outcome of the inter-institutional negotiations). Importantly, if countries fail to implement their notified plan of action, this could be grounds for a complaint of non-compliance. Trade sanctions including the withdrawal of preferences are flagged in the case of FTA partners where there are serious violations by the partner country of its Paris Agreement commitments. Future trade agreements with G20 countries will require a common ambition to achieve climate neutrality. These changes will only come into effect over time, and it is too early to say what their practical impact will be.

Using trade preferences to incentivise climate action in partner countries is a two-edged sword. Recalling the objectives of trade policy measures set out at the beginning of this report, trade preferences are designed to reduce emissions in those countries that export to the EU and thus to reduce the consumption footprint of EU imports. However, free trade agreements are voluntarily negotiated between the parties. If the EU insists that its negotiating partner should make stronger commitments on climate and other sustainability issues, the partner in turn will likely demand greater market access concessions as the price of its agreement. By offering greater preferential access, the EU may incentivise its trading partners to take additional climate action but opening its own market to additional imports may adversely impact the competitiveness of its domestic producers. In this case, there may be a trade-off between using trade policy to reduce the external climate footprint of EU consumption and avoiding the loss of competitiveness of EU producers arising from implementation of a stricter climate regime.

CBAM FOR AGRICULTURAL PRODUCTS

The Commission CBAM proposal

The EU Emissions Trading System (ETS) puts a cap on greenhouse gas (GHG) emissions, and divides this into emissions allowances that permit the emission of one tonne of carbon dioxide (CO_2) or CO_2-equivalent. Just over half of these allowances are auctioned.[32] Industries at risk of carbon leakage (i.e., relocation of production because of differences in carbon prices) receive free ETS allowances. Indirect costs of higher electricity prices can also be compensated for electricity-intensive undertakings by Member States under approved State Aid measures, although this is an optional measure.

In connection with the more ambitious emissions reduction targets included in the European Climate Law, the Commission proposed in July 2021 a Carbon Border Adjustment Mechanism (CBAM) to address the risks of carbon leakage as a result of increased Union climate ambition (European Commission 2021d). The mechanism is an alternative to the grant of free allowances and other measures that address the risk of carbon leakage in the ETS. Leakage will be mitigated by requiring importers in the EU to pay a carbon price at the EU border equivalent to that faced by EU producers under the EU Emissions Trading Scheme (ETS). The basis for the border levy will be the actual embedded emissions in the imported good, which will require to be verified by accredited verifiers. The EU importer can deduct the cost if exporters can show they have paid a price for the carbon used in production. This will both limit the loss of competitiveness of EU producers and thus the risk of carbon leakage, while also providing an incentive to exporters to reduce their emissions and thus global emissions overall. The Commission proposed that the CBAM should initially cover five sectors: cement, iron and steel, aluminium, nitrogen fertilisers (mineral phosphorus and potassium fertilisers are not included if they do not contain nitrogen) and electricity. In 2026, the Commission will evaluate whether to extend the scope to include other products. Most of the revenue generated by CBAM would go to the EU budget as part of new own resources (COM(2021) 566).

Under the Commission's proposal, there would be a transitional phase starting in 2023 where importers in these sectors would have to report their embedded GHG emissions of CO_2 and, where relevant, nitrous oxide and perfluorocarbons, but would not yet have to pay the carbon levy. Once the CBAM becomes fully operational in 2026, EU importers of these products will need to purchase carbon certificates corresponding to the carbon price that would have been paid to produce the goods in the EU, as free allocations are gradually reduced.

32 In total, the Commission estimated that 57% of the total amount of general allowances were auctioned in phase 3 of the EU ETS (2013-2020) and that in phase 4 (2021-2030), the share of allowances to be auctioned will remain the same. Commission, Auctioning. The remaining 43% of allowances are distributed free to ETS installations at risk of carbon leakage.

The Commission CBAM proposal is at the time of writing (November 2022) in the trilogue process between the EU institutions. The Council's general position on the CBAM proposal adopted in March 2022 remains close to the Commission proposal.[33] It does not propose widening the sectors covered in the pilot phase, apart from covering fertilisers that also include potassium and phosphorus. It supports the Commission's proposal to phase in the CBAM over the period 2026-2035, but proposes a different phase-in rate, which would be slower at the start and faster towards the end of the ten-year period. Importantly, it flagged that the issue of limiting potential carbon leakage from exports calls for appropriate solutions to ensure economic efficiency, environmental integrity and WTO compatibility without, however, proposing any specific mechanism. The Council also noted the importance of greater international cooperation with third countries, including through the establishment, in parallel to the CBAM, of a climate club where carbon pricing policies can be discussed and encouraged.

The Parliament, in its March 2021 own-initiative resolution on an EU carbon border adjustment mechanism compatible with WTO rules, had suggested that all imports of products and commodities under the EU ETS should be included in the mechanism, while highlighting the need to provide special treatment to least developed countries (LDCs). The Parliament's first reading position on the Commission's CBAM proposal adopted in June 2022[34] amended the proposal's scope to include organic chemicals, plastics, hydrogen and ammonia as well as indirect emissions. It also shortened the proposed timeline, calling for the start of the phasing-out of free allocations to be delayed by one year to 2027 but completed by 2032 which is three years earlier than proposed by the Commission. Revenue from the CBAM would accrue to the EU budget, but an equivalent amount would be earmarked to support least developed countries' efforts to decarbonise their manufacturing industries and meet international commitments such as the Paris Agreement. The Parliament supported a centralised EU CBAM Authority rather than having 27 competent authorities to ensure uniform application at the EU's borders. Importantly, the Parliament called for EU producers to continue to receive free allocations under the ETS for products destined for export to third countries without carbon pricing mechanisms similar to the ETS. It combined this with a request to the Commission to produce a report by end December 2025 on the impact of the ETS and CBAM on the production of covered goods that are produced for export as well as an assessment of the WTO compatibility of this derogation.

A CBAM for agriculture?

The Parliament's AGRI Committee in its Opinion to the Environment Committee on the CBAM proposal noted that where trading partners have very different policy approaches to emissions mitigation leading to a significant difference in the price of GHG emissions, there is a risk of carbon leakage. It noted that this risk occurs not only for industrial goods but also potentially for agricultural products (Amendment proposed to Recital 8).[35] It called for the inclusion of agricultural products after the phasing-in period and requested that the Commission should assess the possibilities for such an extension by 2030 at the latest. It called on the Commission to monitor the stability of the Union agricultural markets and "foresee the viability of agricultural production as effect of the implementation of the CBAM certificates for the sectors involved". It also proposed that some of the CBAM revenue could be earmarked to help finance transitional measures for downstream Union economic sectors that could be adversely affected. However, these amendments were not included in the Parliament's first reading position.

At face value, the case for including agri-food products in the CBAM is not a strong one. The CBAM is tied to the EU's Emissions Trading System and is being introduced as an alternative to the free allocation of emissions allowances within the ETS to limit carbon leakage. Agriculture is not included in the ETS and neither does it face a carbon price on its emissions.

It is possible that agriculture in future will face stricter climate regulations that may be equivalent to an implicit carbon price. But establishing the per unit carbon price equivalent of these domestic measures with respect to domestic products would not be straightforward.

The CBAM could have an indirect effect in raising production costs in agriculture given that conventional agriculture is heavily dependent on fossil fuel inputs (fertiliser, pesticides, fuel, and electricity). These prices will increase as ETS allowance prices increase and the CBAM takes effect. This could make a case for compensating agriculture for these higher indirect

33 Council of the European Union, Regulation establishing a carbon border adjustment mechanism: General approach, Document 6978/22, 12 March 2022.
34 European Parliament, Opinion of the Committee on Agriculture and Rural Development for the Committee on the Environment, Public Health and Food Safety on the proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism (COM(2021)0564 – C9-0328/2021 – 2021/0214(COD)).
35 See the EU Pesticides Database.

costs as is currently possible in the case of higher electricity costs in the ETS. On the other hand, the very point of higher costs on emissions-intensive inputs is to encourage farmers to reduce their use of them and to seek alternatives. The case of fertiliser is discussed in more detail later.

We noted previously that the Commission plans by December 2023 to carry out a study to assess the potential of applying the polluter-pays principle to GHG emissions from agricultural activities (COM(2021) 800, p. 9). This could lead to agriculture being included in the future in a cap-and-trade scheme to reduce emissions which could open the possibility for discussions on a CBAM for food. The Commission's CBAM proposal provides for a review before the end of 2026 which should also assess the possibilities to further extend its scope to other goods at risk of carbon leakage.

Practical challenges

In addition to this objection in principle to extending CBAM to food at this time, a major technical challenge in applying a CBAM to food is to determine the carbon emissions content of an import and to apply a tax that is commensurate with that content in order to ensure a level playing field with domestic products that are subject to a carbon tax.

The Commission CBAM proposal provides that the levy will be applied to the actual embedded emissions in a specific product from a specific exporter and that this amount will be certified by an independent verifier. For agri-food products, this is often seen as an insuperable problem to implementing a CBAM because of the complexity of the supply chain of these products often encompassing more than one country. The task is to account for all GHG emissions embodied in imported agricultural and food commodities. To establish the precise emissions content of a simple product such as a beef steak, for example, would require knowing how the cattle were reared, their feeding regime, their age at slaughter, and a host of other detailed management characteristics. Establishing the emissions content of a complex product such as a pizza or lasagne where the inputs may be supplied by different countries would be even more difficult. This is particularly the case if inputs are to be credited with any carbon levy that may have been paid in the country of production.

Although currently there is no country that has introduced an explicit pricing scheme for agricultural emissions, let us assume these become more widespread. For food commodities that depend on complex supply chains, it would be necessary to work out exactly how much value was added where. For example, suppose that China exported a lasagne product to the EU using lamb produced in New Zealand. Let us also assume that New Zealand taxes agricultural emissions but China does not. This would mean that the carbon tax at the EU border should be adjusted to account for the differing components sourced in countries with different emissions pricing policies. This would require detailed origin information, similar to that required to establish origin to benefit from tariff preferences in a free trade agreement, for all EU food imports, as well as detailed information on the climate policies applicable to that product in each country. Any company wishing to import a food product into the EU would have to produce a verified emissions report that would have to include all the emissions embedded in any inputs it used wherever sourced. For this reason, it is understandable that the CBAM proposal focuses on goods that are 'pure' commodities and that have short and easily traceable supply chains. But if it were decided to levy a CBAM levy only on basic agricultural commodities but not on processed foods for this reason, this would give rise to very distorted incentives for tradable goods.

The CBAM proposal provides an alternative methodology in cases where actual emissions cannot be adequately determined. Where this is the case, embedded emissions should be determined by reference to default values according to procedures set out in Annex III to the CBAM Regulation, using the following ranking:

- Set the default value at the average emission intensity of each exporting country and for each of the covered goods other than electricity, increased by a mark-up, the latter to be determined in the implementing acts of this Regulation.

- If reliable data for the exporting country cannot be applied for a type of goods, the default values shall be based on the average emission intensity of the 10 per cent worst performing EU installations for that type of goods.

If applied to food, this would still require the Commission to establish exporter-specific default values for all primary foodstuffs. There are more than 350 individual plant and animal products for which Maximum Residue Limits (MRLs) are set for pesticide residues.[36] However, unlike MRLs for which a single

36 See the EU Pesticides Database.

unique value is established for all imports, CBAM default values would have to be set separately for all potential exporters. The impact assessment undertaken for the CBAM Regulation did examine the merits of setting a single emissions value for an individual product based on the Best Available Technology used by the top 10% of EU producers. While this would simplify the administrative task as the same default value would apply to all exporters, it would greatly diminish the incentive that exporters would have to seek ways to reduce their emissions, given that the levy they would pay would remain exactly the same regardless of any steps they took to mitigate their emissions.

The potential severity of these practical problems will become clearer as experience is gained with the application of the CBAM levy to the narrower range of industrial products envisaged in the CBAM Regulation.

A CBAM on exports

Another important issue for the agricultural sector is whether any carbon price on domestic production would be rebated on exports. Nordin et al. (2019) assess the potential for a CBAM to limit the leakage of emissions and preserve the competitiveness of the EU agricultural sector in the absence of a rebate for exports. Their simulations are based on imposing a carbon tax of €120/$C0_2$e at the farm gate and comparing emissions with and without a CBAM for a reference year 2030. Because of different emissions intensities of production between EU Member States, this implies Member States have different tax rates for similar products. Similarly, their CBAM design imposes the same tax per unit of CO_2e on imports, but because of differences in emissions intensities between exporting regions, the levy paid per unit of product differs depending on the source of imports. With these assumptions, their results show that even though a CBAM reduces emission leakage, 92% of the emission reduction in the EU is still offset by emission increases outside the EU.[37] This is explained by the fact that a CBAM only adjusts for the reduced competitiveness on the EU internal market, while EU exports are largely replaced by commodities produced in less GHG-efficient countries.[38] They conclude that a CBAM based on imports alone cannot solve the high risk of emission leakage in the agri-food sector as a consequence of unilateral EU climate action. As noted previously, however, there are mixed views on whether rebating a carbon tax (let alone the cost of allowances in a cap-and-trade scheme) would be consistent with WTO rules. For example, a tax rebate would provide a competitive advantage to European producers exporting to markets taxing carbon domestically (or enforcing regulations having an implicit carbon price) that do not impose a CBAM. For this reason, the Parliament's first reading position calls for the continuation of free allowances only for exports to countries that do not have in place a carbon pricing scheme equivalent to the ETS.

Implications of including fertiliser in CBAM

The proposed CBAM Regulation could contribute to carbon leakage in agriculture through the input cost channel identified above given that it is proposed to include fertiliser, an important agricultural input, in the CBAM (Table 1). The inclusion of fertiliser was supported by the European Parliament in its resolution of March 2021:

"Considers that in order to prevent possible distortions in the internal market and along the value chain, a CBAM should cover all imports of products and commodities covered by the EU ETS, including when embedded in intermediate or final products; stresses that as a starting point (already by 2023) and following an impact assessment, the CBAM should cover the power sector and energy-intensive industrial sectors like cement, steel, aluminium, oil refinery, paper, glass, chemicals and fertilisers, which continue to receive substantial free allocations, and still represent 94 % of EU industrial emissions."[39]

36 See the EU Pesticides Database.
37 The high leakage rate in this study reflects the fact that it does not allow for technical or management mitigation options, see Annex 2.
38 Clora et al. (2021) also find that an import CBAM has a limited impact on the leakage rate for agri-food products, reducing it from 52% to 49% in their model, but this may reflect their assumption that the border carbon levy (assumed at USD 40/tonne CO_2e) is only imposed on direct emissions. As direct emissions in processed food do not include non-CO_2 emissions from primary agriculture, the CBAM tariffs are relatively low for processed food imports (between 0.03 and 1.06 percentage points).
39 European Parliament, A WTO-compatible EU carbon border adjustment mechanism: European Parliament resolution of 10 March 2021 towards a WTO-compatible EU carbon border adjustment mechanism (2020/2043(INI)).

Table 1. List of fertiliser products and GHG gases to be covered by the CBAM

CN CODE	Greenhouse gas
2808 00 00 - Nitric acid; sulphonitric acids	Carbon dioxide and nitrous oxide
2814 - Ammonia, anhydrous or in aqueous solution	Carbon dioxide
2834 21 00 - Nitrates of potassium	Carbon dioxide and nitrous oxide
3102 - Mineral or chemical fertilisers, nitrogenous	Carbon dioxide and nitrous oxide
3105 - Mineral or chemical fertilisers containing two or three of the fertilising elements nitrogen, phosphorus and potassium; other fertilisers; goods of this chapter in tablets or similar forms or in packages of a gross weight not exceeding 10 kg. Except: 3105 60 00 - Mineral or chemical fertilisers containing the two fertilising elements phosphorus and potassium	Carbon dioxide and nitrous oxide

Source: Commission COM(2021) 564

However, the AGRI Committee in its Opinion to the Environment Committee on the CBAM proposal expressed concern about the impact of the inclusion of fertilisers in the CBAM on EU agriculture, food supply, food security and food autonomy and called for this impact to be reviewed before the CBAM applied.[40]

This concern was also expressed by COPA-COGECA which represents European agribusinesses and farmers. Commenting on the CBAM proposal, it says: "If the Carbon Border Adjustment Mechanism does not apply to agricultural products [which they would potentially support], it should not apply to fertilisers either. Nitrogen fertilisers are the most important input in crop production and the main variable cost item for our cereal and oilseed farms. However, the price of fertilisers is already higher in Europe than in the rest of the world because our fertiliser market is protected by customs duties and antidumping measures that cost European farmers €600 million a year. If a border adjustment mechanism were to be added to this, the price of fertilisers would skyrocket, further increasing the cost of agricultural production in Europe, while making the use of imported food more competitive and attractive."[41]

The industry association Fertilizers Europe insists that it needs a CBAM as part of a package of support to facilitate modernisation of its fertiliser plants. It seeks the continuation of free allowances in addition to the introduction of the CBAM at least until 2030, not least to ensure the competitiveness of EU fertilisers on export markets.[42]

The EU fertiliser industry is currently subject to a carbon cost via the ETS. European producers surrender allowances for the CO_2 emitted in ammonia production, and in the case of nitrate-based fertilizers also for the N_2O released in nitric acid production (Copenhagen Economics 2015). The European industry is almost unique, globally, in facing this cost. When considering the Commission's two traditional criteria for assessing carbon leakage risks, emission intensity and trade intensity, nitrogen fertiliser is among the industries at the absolutely highest risk.

Under the current ETS, because the EU fertiliser industry is deemed to be very sensitive to trade leakage, it receives receives most of its allowances for free (possibly around three-quarters).[43] Since 2013 free allowances have been distributed on the basis of product benchmarks rather than as previously on the basis of the historical emissions of each enterprise. A product benchmark is based on the Best Available Technology (BAT) reference level defined as the average of the 10% most greenhouse gas efficient installations, in terms of metric tons of CO_2e emitted per ton of product produced at European level. The allowances received by the EU fertiliser industry are based on EU benchmarks for the main ingredients that make up nitrogenous fertiliser, namely ammonia and nitric acid.

The CBAM proposal is to eliminate free allowances under the ETS over time and instead to introduce a CBAM levy which would be paid by importers of fertilisers from third countries. The amount of the levy would be related to the embedded emissions

40 European Parliament, Opinion of the Committee on Agriculture and Rural Development for the Committee on the Environment, Public Health and Food Safety on the proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism (COM(2021)0564 – C9-0328/2021 – 2021/0214(COD)).
41 COPA-COGECA, Statement on the resolution adopted by the European Parliament on EU carbon border adjustment mechanism (CBAM), 12 March 2021.
42 Fertilizers Europe, Industry supports CBAM. Parliament position not good enough, 22 June 2022.
43 European Commission, Impact Assessment Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC to enhance cost-effective emission reductions and low carbon investments, SWD(2015) 135.

in the imported fertiliser. The EU fertiliser industry is much more emissions-efficient than exporters in third countries. Thus, the CBAM levy calculated on the basis of exporter-specific emissions will likely be much higher than the levy paid by EU fertiliser manufacturers even when based on the same allowance price for tonne of GHG emission.

The likely impact on fertiliser prices will be determined by (a) the impact of the withdrawal of free allowances on the price of fertilisers, and (b) the impact of introducing the CBAM levy on imported fertiliser. The impact of (a) depends on how the free allowances currently received by the fertiliser industry are reflected in the price of fertilisers. A study commissioned by Fertilizers Europe estimated that, in the absence of free allowances, an ETS price of €30 would increase average production costs for the two main nitrogen fertilisers urea and ammonium nitrate production by 17-18 per cent, and by an additional 12 per cent if the ETS price reaches €50 (Copenhagen Economics 2015). From the perspective of fertiliser buyers, a key issue is the ability of the industry to pass through these additional costs in the form of higher prices. This depends on the degree of competition particularly from imports in the EU fertiliser market. The Copenhagen Economics study finds that the cost pass-through potential for EU fertiliser production is limited, which is also supported by another study (CE Delft 2016). The implication is that much but not all of the cost of withdrawing free ETS allowances would be borne by the industry rather than passed on the form of higher prices to farmers. To the extent that the industry has had some potential to pass the ETS allowance price on to their customers, the allocation of free allowances may have allowed the industry to make windfall profits in the past (CE Delft, 2016).

However, if it is assumed that the market price for fertilisers is largely determined by import competition and the price of imports, then the extent of the cost pass-through would be relatively low. The corollary of this assumption is that if the price of imported fertiliser is increased by a CBAM levy, we would expect this to be reflected immediately in the domestic price of fertilisers. Substituting a CBAM import levy for free allowances for the EU fertiliser industry will likely increase the cost of fertiliser for EU farmers.

The Commission's own impact assessment of the impact on downstream sectors suggests a very modest impact (SWD(2021) 643 Part 1/2 p. 63 Figure 13). It highlights that "Support measures for farmers in adapting to changes in fertiliser price or sourcing should be made available under existing appropriate instruments, notably the CAP and the NextGenerationEU, rather than compromising the efficacy and WTO compatibility of the CBAM itself."

Conclusions and recommendations on CBAM for agri-food products

The EU is currently negotiating the introduction of a CBAM levy on a selected number of industrial products based on a Commission proposal. The proposal would require importers of these products to pay a levy on the actual embedded emissions equivalent to the price of allowances in the ETS. Any carbon price paid on emissions in the exporting country can be offset against the levy. There is no provision for differentiating the size of the levy according to the development status of the exporter (for example, the Commission argues against exempting exports from least developed countries (LDCs) from the levy because this would encourage LDCs to increase their level of emissions). It is not clear that imposing a uniform levy on embedded emissions in imports reflects the principle of 'common but differentiated responsibilities' in the Paris Agreement.

A carbon border adjustment levy on agri-food products would only be justified if the production of agri-food products in the EU were subject to a carbon tax or similar charge such as under a cap-and-trade system. This is not the case at present, so a CBAM for agri-food products is not possible. However, if agricultural emissions were subject to a levy in the future, it would open the possibility for a similar levy to be applied on imports.

Even if a CBAM levy on imports were legally possible, there would be significant practical issues in applying it to agri-food imports.[44] The experience gained with applying a CBAM levy to the initial group of five industrial products, plus any extension to other products after 2026, will be informative on how easily these administrative and enforcement issues can be overcome. Given the important role of agri-food exports in the EU, a carbon levy on imports alone is unlikely to be very effective in preventing carbon leakage. At the time of writing (November 2022), it remains unclear if the EU CBAM proposal will include provision for rebating any domestic carbon levy on exports.

44 A report by Ricardo Energy & Environment for the UK Climate Change Commission that examined the application of trade policy measures to avoid carbon leakage in the agricultural sector in the UK also concluded that a CBAM for agri-food products would be premature and recommended that it should be limited to inorganic fertilisers (Ricardo 2022).

The inclusion of fertilisers in the EU CBAM proposal will lead to an increase in the price of imported fertilisers and thus in the EU market price for fertilisers. As the European Parliament has recognised, it is appropriate that the embedded emissions in using fertiliser should be reflected in its market price. This provides a necessary signal to the industry to seek to reduce emissions and to farmers to look for alternative ways to maintain soil fertility. Fertiliser prices at the time of writing (November 2022) have dramatically escalated over the past year due to the rising cost of natural gas. The CBAM would only be phased in from 2026 or 2027 (depending on the outcome of the inter-institutional negotiations) and it is not clear what market conditions will prevail in four or five years' time. Whether there is a case for further transitional assistance to help farmers adapt to higher fertiliser prices by changing to practices that reduce use of chemical fertiliser will need to be evaluated at that time.

MANDATORY IMPORT STANDARDS

Implementing import standards

The French EU Presidency in the first semester of 2022 made one of its priorities the reciprocity of trading standards - in other words, ensuring (chiefly by means of 'mirror clauses') that agri-food products imported into Europe abide by the EU's environmental and health standards. This followed the commitments in the 2021 Trade Policy Review (European Commission 2021f) and the 2021 CAP political agreement that imports of agri-food products should adhere to the production practices required of EU producers. The Commission subsequently published a report on the application of EU health and environmental standards to imported agricultural and agri-food products (European Commission 2022a). The European Parliament has led the call for imported agri-food products to meet the same production standards as EU producers. For example, in the area of climate, the European Parliament in its resolution on the EU methane strategy called on the Commission to ensure a level playing field for EU producers by insisting that imports from third countries meet the same high standards as in the EU (European Parliament, 2021).

Environmental standards can be designed in two ways, either as practice or performance based standards. Practice-based standards refer to the specification of technologies required or prohibited in the production of the targeted products. For example, if an active substance for use in pesticides is banned in the EU, the import of products produced in exporting countries with the aid of such pesticides could also be banned. Alternatively, performance based standards specify a particular performance level or result to be achieved using a defined environmental performance indicator, such as emissions or resource efficiency, leaving the choice of the technologies to be used to achieve these targets to the relevant producers.

What might a mandatory climate standard look like? If we consider a possible performance standard, one might require, for example, that only beef with an emissions footprint lower than a specific reference level would be permitted to enter the EU. This would immediately raise the issue of measuring exporter-specific embedded emissions. An alternative would be to consider a practice-based standard. For example, one could specify that only beef produced with the aid of a methane inhibitor or feed supplement intended to reduce enteric emissions can be imported into the EU if this regulation also applied to EU producers. A pertinent example of a practice-based standard would be a prohibition on the import of beef from cattle that have grazed on recently deforested land. The EU has chosen to address the deforestation issue using a different trade policy instrument, namely mandatory due diligence (discussed in a later section).

Both performance and practice-based standards have been applied to the import of biofuels under the Renewable Energy Directive 2009/28/EC (RED I). This provides a good example of how import standards work in practice. RED I required that Member States should ensure that the share of renewable energy in all forms of transport in 2020 was at least 10% of the energy used for transport in that Member State. At that time, biofuels (either bioethanol or biodiesel) were almost the only available forms of renewable energy in transport. RED I set down that only biofuels certified as sustainable could be taken into account for the achievement of the 10% transport target. The sustainability criteria set out in RED I included:

- that greenhouse gas emission savings from the use of biofuels must be at least 35%, rising to 60% for installations in which production started on or after 1 January 2017;
- that biofuels should not be made from raw material obtained from land with high biodiversity value (i.e., primary forest and other wooded land, nature protected area, highly biodiverse grassland);

- that biofuels should not be made from raw material obtained from land with high carbon stock (i.e. wetland, forested area, peatland);

- and that agricultural raw materials cultivated in the EU and used for the production of biofuels should respect the minimum requirements for good agricultural and environmental conditions and some statutory management requirements defined by the CAP.

RED I has been amended and updated several times to increase the minimum greenhouse gas emission savings threshold for biofuels and bioliquids produced in new installations and to include provisions to address the impact of indirect land-use change given that current biofuels are mainly produced from crops grown on existing agricultural land. Operators show that the biofuel they placed on the market is sustainable either by fulfilling the requirements of national control systems or by making use of volun¬tary schemes recognised by the Commission. As the national control systems also make use of the certificates issued by the voluntary schemes, they effectively certify most of the sustainable biofuel placed on the EU market. The RED precedent illustrates how an import standard based on compliance with particular land uses would operate. It requires a certification system in the exporting country that confirms that the exported product meets the EU standards.

Conclusions and recommendations on mandatory import standards

Environmental standards do not necessarily impact the characteristics of the product produced. They refer instead to the processes and methods used in its production. Compliance is ensured by means of a certification system implemented by verifying bodies in the exporting countries as well as by the competent authorities for operators in the Member States. In international law, environmental standards are governed by the WTO Technical Barriers to Trade Agreement. The principal requirement is that any import standards do not discriminate between domestic and imported products. Any requirements that are imposed on imports must, at a minimum, also apply to domestic producers. This limits the scope for import standards specifically relevant to climate policy given that, at the moment, no EU-wide climate standards are in force. Without identifying a standard that is mandatory for EU producers to apply, there are no grounds to introduce import standards. For one possible standard (that agricultural products cannot be placed on the EU market if they are produced on recently deforested land), the EU has decided to address embedded emissions through mandatory due diligence (see below), so it is unlikely to also require it as part of an import standard.

An example of a possible standard might be the limit on the application of organic manure in nitrate vulnerable zones of 170 kg N/ha under the EU Nitrates Directive 91/676/EEC. While this is primarily intended to address water quality issues, it also limits emissions of nitrous oxide which is a greenhouse gas. Suppose the EU was to require that imports of agricultural products should only be permitted provided it can be demonstrated that they originate from farms that meet this standard. One problem is that not all farms in the EU are required to meet this standard. It only applies in areas designated as nitrate vulnerable zones, and even in these areas farmers are often given derogations provided they adopt complementary measures to avoid run-off. Another problem is that other countries may have in place measures to reduce nitrous oxide emissions using a different policy intervention. This raises the issue of equivalence. WTO rules do not insist that countries must have exactly the same rules in place, if they can be shown to have equivalent effect. This concept of equivalence is widely applied in the case of animal and plant health regulations. However, it is more difficult to apply in the case of an environmental standard because implicitly it requires a particular performance outcome to be achieved, in order to assess whether different practices required of farmers are equivalent or not.

An example of a potential standard is the Commission ambition that all farmers should be able to estimate their farm-level carbon footprint (emissions and sequestration) by 2028. If this were made a regulatory requirement, it could become the basis for a similar requirement for imported products. But simply measuring net emissions does not, in itself, require that emissions be reduced even if it may be a prerequisite for particular policy instruments that could drive those reductions.

If these practical issues could be addressed in defining a climate import standard, it could be effective in achieving a level playing field for EU producers with respect to competition on the EU market. However, its overall impact in reducing carbon leakage and reducing global emissions may be limited, for two reasons.

The first is that an import standard does not level the playing field for EU exports. To the extent that climate policy leads to higher costs for EU producers, this will also make exports more expensive, leading to a loss in global market share. Markets that were

previously served by EU exports would now be served by competitors potentially with products of a higher emissions intensity. Reference is made again to the Nordin et al. (2019) study that assessed the potential for a CBAM to limit the leakage of emissions and preserve the competitiveness of the EU agricultural sector. Recall that their results showed that even though a CBAM reduces emission leakage, 92% of the emission reduction in the EU is still offset by emission increases outside the EU largely because of this export effect.[45] The fact that the EU is a net exporter of nearly all of its domestic production (the few exceptions include oilseeds, coarse grains and rice) underlines the importance of this effect. While at least in theory a CBAM could be designed to also include exports (by providing an export rebate for any explicit carbon price paid), this is not a possibility even in principle when considering an import standard.

The other mechanism that can limit the effectiveness of import standards in reducing global emissions is referred to as *resource shuffling* (this also applies to a CBAM). This is the risk that an EU import standard intended to reduce the global production of higher emission products may instead only redirect higher emission exported products toward those countries with less stringent regulations. In other words, imports by the EU may meet the required standard but if these account for a relatively small proportion of the exports of the exporting country its overall emissions may be little affected. A possible solution would be to accompany the import standard with cooperation agreements with exporting countries to ensure that all their exported products meet the required standards. Such partnership agreements are foreseen as a part of mandatory due diligence measures around deforestation discussed later.

MANDATORY SUSTAINABILITY DUE DILIGENCE

Corporate sustainability due diligence initiatives are an increasingly important component of the EU trade policy toolkit. Due diligence in this context means preventing and mitigating any adverse impacts on human rights or the environment arising from a company's activities. It is not entirely correct to describe them as trade policy instruments, as their obligations cover both domestic and imported sourcing. However, the fact that the obligations also cover goods imported into the EU market does give them a trade policy significance.

Sustainability due diligence initiatives can be voluntary or mandatory. The EU Voluntary Code of Conduct on responsible food business and marketing practices that entered into force in July 2021 was one of the first deliverables of the F2F strategy. However, voluntary actions by industry have well-known limitations. Those businesses that sign up to these agreements are often the 'best in class', whereas businesses that account for the majority of environmental damage are often not participants. For this reason, the EU has moved to strengthen voluntary due diligence by making it mandatory for larger companies.

The Commission proposal for a Directive on Corporate Sustainability Due Diligence (COM(2022) 71) aims to introduce a legislative framework requiring, among other things, mandatory environmental and human rights due diligence by companies. The proposal aims to address the concerns of consumers who do not want to buy products that are made with the involvement of forced labour or that damage the environment and to support businesses by providing legal certainty about their obligations in the EU single market. This initiative is complementary to another legislative proposal, the proposed Corporate Sustainability Reporting Directive (COM(2021) 189), which would require large public companies to disclose sustainability-related matters. Mandatory due diligence is already required for operators under the EU Timber Regulation (EU) No 995/2010 which focuses on preventing the placing of illegally harvested timber and timber products on the EU market. The Commission made a proposal to complement this with a Regulation on deforestation-free supply chains in November 2021 (COM(2021) 706). The next section uses deforestation as a case study of how mandatory due diligence can work given its particular relevance to climate change.

Using mandatory due diligence to limit emissions from global deforestation

The context

Agricultural emissions accounted for around 22% of global greenhouse gas (GHG) emissions in 2019, where 11% were emissions from direct agricultural production and 11% were indirect emissions from land clearing and deforestation associated with the expansion of agricultural production (IPCC 2022).[46]

45 The high leakage rate in this study reflects the fact that it does not allow for technical or management mitigation options, see Annex 2.

46 It is worth noting that estimates of LULUCF CO_2 emissions vary widely across bookkeeping models, with judged uncertainties around ±50% at the global level (Friedlingstein et al. 2019).

Emissions from land-use and land-use change, mostly due to deforestation, are the second biggest cause of climate change after burning fossil fuels, and approximately 90% of global deforestation is caused by agricultural expansion.[47] The main drivers of deforestation vary geographically. Expansion of agricultural land dedicated to palm oil plantations is a major cause of deforestation in Southeast Asia, the clearing of forests for pastures for cattle and for soy plantations and land speculation (land grabbing, often associated with forced displacement of local communities) are the top drivers in South America, while expansion of cocoa plantations is an important driver of deforestation in Central and West Africa (European Commission 2021). EU consumption during the period 2008-2017 was responsible for 19% of the tropical deforestation embedded in the international imports of the six commodities most responsible - palm oil, soy, cattle, cocoa, coffee and wood – and 6% if domestic consumption of producing countries is considered (European Commission 2021 based on data in Pendrill, Persson, and Kastner 2020).

In explaining the meaning of carbon leakage earlier in this report, the distinction was highlighted between emissions embedded in imports due to the structure of international trade and import-related emissions arising from differences in national climate policies. EU imported emissions from forest-risk commodities are primarily due to the broader drivers of international trade and have not been caused by more stringent climate policy in the EU. Global deforestation and forest degradation can become more relevant to the issue of carbon leakage arising from greater ambition to mitigate emissions from the agri-food system in the EU in the future. Deforestation emissions enter into the calculation of the emissions intensity of imported products which, as previously explained, plays an important role in determining carbon leakage. For example, if in future EU climate policy resulted in a reduction in cattle numbers and an increase in imports of beef, the extent of carbon leakage would be reduced if the exporting countries demonstrate they have zero deforestation emissions.

EU legislation

The leakage rate can be influenced by EU legislation to limit deforestation. The initiative of greatest relevance for climate policy is the Commission proposal for a Regulation on deforestation-free supply chains in November 2021 (European Commission 2021c). The proposed Regulation will set mandatory due diligence rules for operators which place specific commodities on the EU market that are associated with deforestation and forest degradation – soy, beef, palm oil, wood, cocoa and coffee and some derived products, such as leather, chocolate and furniture. The lists of commodities and derived products will be subject to review after two years. Its purpose is to ensure that only deforestation-free and legal products (according to the laws of the country of origin) are placed on the EU market. Operators must ensure not only that the products they import on this list are produced in accordance with local legislation, but also that they are not planted on land that has been deforested or, for wood, has been harvested without inducing forest degradation, after a cut-off date (proposed as 31 December 2020). Operators assume responsibility for the compliance of the relevant commodities or products that they intend to place on the Union market or to export by making available due diligence statements. The inclusion of wood in the list of commodities means that the new law is proposed to substitute for the obligations in the Timber Regulation and the latter will be repealed. The Commission estimates that the proposal will reduce carbon emissions due to EU consumption and production of the relevant commodities by at least 32 million metric tons a year (European Commission 2021c).

Operators will be required to collect the geographic coordinates of the land where the relevant commodities they place on the market were produced as well as the date or time range of production. This strict traceability is meant to ensure that only deforestation-free products are placed on the EU market – and that enforcement authorities in Member States have the necessary means to control that this is the case. Unlike the Timber Regulation, the obligations apply both to products placed on the EU market and exported from the EU. The legislation provides greater clarity on the due diligence requirements that an operator should take as well as strengthening the system of compliance checks which are the responsibility of Member States. A benchmarking system, operated by the European Commission, will identify countries as presenting a low, standard, or high risk of producing commodities or products that are not deforestation-free or in accordance with the legislation of the producer country. Obligations for operators and national authorities would vary according to the level of risk assigned to the country of production. The country benchmarking system aims to incentivise countries to ensure stronger forest protection and governance and to better calibrate enforcement efforts by helping competent authorities to focus resources where they

47 FAO, COP26: Agricultural expansion drives almost 90 percent of global deforestation, 6 November 2021.

are most needed. Although the Regulation is seen as mainly preventing the import of agri-food and wood products at risk of contributing to deforestation, it will apply to both domestic and imported products so they are measured by the same standards. For the two commodities on the list that are produced in the EU (beef and soy), the due diligence obligations on farmers producing these commodities will need to be clarified.

At the time of writing (November 2022) this draft Regulation is being discussed in the inter-institutional legislative process. The Parliament's first reading position welcomed the proposal and called for it to be strengthened in several ways.[48] It proposes to extend the scope of the legislation to include pigmeat, sheep and goats, poultry, maize and rubber, as well as palm-oil based derivates, charcoal and printed paper products. It calls on the Commission within two years to evaluate whether the rules need to be extended to other goods such as sugar cane, ethanol and mining products. It wants due diligence obligations to be extended to financial institutions headquartered or operating in the EU that provide financial services to operators importing or exporting the relevant commodities and products. It proposes to bring the cut-off date one year forward, to 31 December 2019. The Committee report also proposes to cover other natural ecosystems such as grasslands, peatlands and wetlands, if deemed appropriate by the Commission, within one year after the entry into force. Due diligence should also be strengthened to consider international human rights and the rights of indigenous people.

The Council in its general position adopted in June 2022 broadly supported the Commission proposal.[49] It maintained the Commission's list of six products to be initially covered by the legislation and focused on the forest ecosystem, apart from some additions of derived products, arguing that it is important to ensure as a first step the proper implementation of the initial proposal while at the same time beginning the work to assess the need and feasibility of extending the scope to other commodities. It proposed some simplification of the due diligence system, while also strengthening the text as regards respect for human rights.

Conclusions and recommendations on mandatory due diligence

The proposal to require mandatory due diligence by operators to ensure deforestation-free supply chains has been broadly welcomed although the final details remain to be settled in the inter-institutional trilogues. In thinking about this instrument as a possible model for other types of climate standards, several issues have been raised in the debate around the Commission proposal that would also have relevance in other climate connections.

There is general agreement that the required actions by companies should be situated within a wider context of partnership agreements with exporting countries. The objective is not simply to clean up EU supply chains, but ultimately to influence the supply-side drivers of deforestation in these countries.[50] This also addresses the risk of reshuffling, where the products exported to the EU meet demanding EU standards and exports that do not meet EU standards are diverted to other markets. The Commission noted that its legislative proposal was complementary to other measures proposed in its 2019 Communication on stepping up action to protect the world's forests (European Commission 2019), specifically, to work in partnership with countries to address root causes of deforestation and to promote sustainable forest management, and to work with major consumer countries, to minimise leakage and to promote the adoption of similar measures to avoid products coming from supply chains associated with deforestation and forest degradation being placed on the market. The Commission proposes to continue to establish forest partnerships with relevant partner countries, with a view to helping producing countries comply with the Regulation.[51] Dialogue with producing countries is also foreseen when the risk category for a country is being established.

The idea of traceability up to each plot of land via geolocalisation is the most innovative element of the proposed legislation as this underpins the ability to perform due diligence. The Commission puts great store on the use of satellite images and positioning – using widely available and free-to-use digital tools such as those available from EGNOS/Galileo and Copernicus – to check whether a product or commodity is compliant or not. This may be feasible

48 European Parliament, Amendments adopted by the European Parliament on 13 November 2022 on the proposal for a regulation of the European Parliament and of the Council on making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (COM(2021)0706 – C9-0430/2021 – 2021/0366(COD)).

49 Council of the European Union, Draft Regulation of the European Parliament and of the Council on the making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 - General approach, 24 June 2022.

50 "To have the greatest impact, Union policy should aim at influencing the global market, not only supply chains to the Union. Partnerships and efficient international cooperation with producer and consumer countries are fundamental in that respect." (Recital 14, European Commission 2021b).

51 "The Forest Partnerships' main objective will be to protect, restore and/or ensure the sustainable use of forest in a comprehensive and integrated way to deliver on the European Green Deal priorities as well as EU's development cooperation objectives like poverty alleviation, good governance, human rights. They will promote forest governance and policy reforms to pursue sustainable forest management and contribute to halting deforestation and forest degradation" (European Commission 2021c).

for crop and tree products that are grown in a fixed position, but will hardly suffice for a product like beef where feeder cattle can be imported on to a farm for finishing from a considerable distance. Here it may be necessary for producing countries to introduce a similar system of beef traceability as in the EU via means such as ear tags, bovine passports and a computerised database.

Even for crop and tree products the practical problems of implementation can be considerable. They are described in the ENVI Committee rapporteur's explanatory statement attached to his initial report to that Committee on the Commission's proposed legislation as follows:[52]

"Commodities with risk of deforestation or forest degradation are often sourced from global supply chains. Companies can have up to 10,000 assortment items and up to 190,000 suppliers in their systems and ingredients with risk relevance can come from an average of 15 countries of origin. The supply chains for these commodities can differ significantly from one commodity to another. Under the current rules, it would not be possible for each product to be traced back to an individual smallholder parcel. For many commodities, operators share supply chain infrastructures. That means that trucks pick up commodities from different regions (deforestation free and non-deforestation free), mix those commodities in storages or mills where they are then transported to ships in mixed tanks that can supply several continents. Making sure that a commodity is "deforestation-free" inevitably means that segregated supply chains will have to be set up. The examples of GMO-free products have shown that this is possible, but it is complicated, requires time and is costly. The rapporteur therefore believes that the Commission should analyse the different supply chains and establish rules on due diligence requirements, traceability tools and liability rules for the different supply chains that are covered by this regulation. These guidelines should also take into consideration the specific nature of commodities. Coffee plants, for example, have to be cut down every five years. Such procedures should not be interpreted as deforestation."

In the light of these potential difficulties, it is promising that the Cocoa Coalition, a network of chocolate companies and NGOs working in the cocoa and chocolate supply chain, confirms that traceability systems, including geolocation information, can be implemented effectively even in complex supply chains featuring a very high proportion of smallholder farmers.[53] It recognises the progress made by producer-country governments led by the governments of Côte d'Ivoire and Ghana, alongside companies, certification organisations and others, in rolling out traceability systems to the farm level. However, the Coalition warns that the Commission must undertake a comprehensive needs assessment of the challenges that will be faced by smallholder farmers in complying with the regulation, and the support that they will require.

The deforestation-free supply chain initiative also builds on several international initiatives with the same objective. The New York Declaration on Forests adopted in 2014 following the UN Secretary General's Climate Summit is a non-legally binding political declaration that endorses a global timeline to cut natural forest loss in half by 2020 and strive to end it by 2030. The Declaration was endorsed by dozens of governments, many of the world's biggest companies, and influential civil society and indigenous organisations.[54] At COP26, more than 100 world leaders representing 85% of the world's forests launched the 'Glasgow Leaders' Declaration on Forests and Land Use' which committed to halt and reverse forest loss and land degradation by 2030. The initiative is backed by $20 billion in public and private finance over five years and support for wider supply chain reforms towards sustainable commodity trade. It is easier to introduce a unilateral measure to pursue this objective when strong commitments have been made at the international level.

A key legislative initiative for EU climate-related action in the future will be the Directive on Corporate Sustainability Due Diligence proposed by the Commission in February 2022. This also builds on international efforts to develop international standards on corporate sustainability due diligence.[55] It is closely related to another proposal for a Corporate Sustainability Reporting Directive. It sets out a corporate due diligence duty to identify, prevent, bring to an end, mitigate and account for adverse human rights and environmental impacts in the company's own operations, its subsidiaries and their value chains. The legislation covers both potential adverse human rights and environmental impacts that are identified in an Annex to the Directive. With respect to climate, the new proposal requires the

52 https://www.europarl.europa.eu/doceo/document/A-9-2022-0219_EN.html#_section3.
53 Cocoa Coalition joint position paper, The proposed EU regulation on deforestation, 23 March 2022.
54 New York Declaration on Forests, 2014.
55 These include the 2011 United Nations Guiding Principles on Business and Human Rights, the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, and the OECD Guidelines for Multinational Enterprises and related Guidance on Responsible Business Conduct. The OECD framework extended the application of due diligence to cover environmental harm.

large and listed companies covered by the Directive to adopt a plan to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement (note that this is the stricter of the two temperature objectives included in the Paris Agreement). The plan would have to identify the extent to which climate change poses a risk to or has an impact on "a company's operations". In case climate change is identified as posing a 'principal risk' for, or as having a 'principal impact' on, a company's operations, the company should include emissions reduction objectives in its plan. Companies will be required to take account of the fulfilment of obligations regarding the corporate climate change plan when setting any variable remuneration linked to the contribution of a director to the company's business strategy and long-term interests and sustainability. The Directive also requires Member States to adapt their rules on civil liability to cover cases where damage results from failure by a company to comply with due diligence obligations. Agriculture and food companies with more than 250 employees on average and with a net worldwide turnover of more than €40 million would be covered by this directive.

At the time of writing (November 2022) this proposal is being considered by the co-legislators. Environmental NGOs have welcomed the legislation but have also asked for it to be strengthened, particularly with respect to the climate action obligations of businesses. These are spelled out in a specific article (Article 15) that refers to combating climate change. Issues raised include limitations in the coverage of companies covered by this obligation, lack of clarity whether indirect emissions are covered or not, the absence of reference to the Paris Agreement and climate impacts in the Annex listing the environmental damages that should be prevented and mitigated, the implicit restriction that only companies for whom climate change is a 'principal risk' or has a 'principal impact' are required to set emissions reduction objectives, and the absence of any guidance or criteria on what an emissions reduction plan should include.[56] It is particularly important that Scope 3 emissions fall within the definition of "a company's operations" because as much as 90% of a company's carbon footprint comes from its Scope 3 emissions.[57]

The significance of this legislation is that it introduces a legal obligation on companies to address the climate impact of their activities. The impact on carbon leakage will be indirect. Companies, such as supermarkets, will have emissions reduction targets. They will source supplies both from domestic producers and from imports. If the targets cover Source 3 emissions and EU-sourced products have a lower carbon footprint, this will encourage a shift to domestic sourcing in order to fulfil their emissions reduction plans. In any event, companies will have an incentive to invest in reducing the emissions footprint of imported as well as domestic products in order to achieve their reduction targets. A reduction in the emissions intensity of imports in itself will reduce the extent of carbon leakage.

56 For example, see Client Earth, Factsheet - Environment and Climate: Corporate Sustainability Due Diligence Directive, June 2022 and European Coalition for Corporate Justice, European Commission's proposal for a directive on Corporate Sustainability Due Diligence, April 2022.

57 Scope 1 emissions are direct emissions in the company's production process, Scope 2 emissions are emissions from energy use and Scope 3 emissions include all indirect emissions in the company's value chain. For details, see the US Environment Protection Agency Scope 3 Inventory Guidance.

5.

CONCLUSIONS AND RECOMMENDATIONS

Emissions leakage or carbon leakage occurs when emissions reduction in a country implementing a climate policy is offset by an increase in emissions in non-implementing countries or in countries with a less ambitious climate policy. Because countries are connected through trade, some emissions leakage will generally be associated with climate policy. The leakage rate is not a fixed number. It will depend on the emissions intensity of domestic production and its exposure to international competition. It will also depend on the availability of technological and management options to reduce the emissions intensity of production; the level of ambition of climate policy both in the implementing and non-implementing countries; and the policy instruments used to reduce emissions. Agricultural production would be expected to have a high leakage rate relative to other sectors based on these criteria. A selection of empirical studies reviewed for this study finds that leakage rates arising from climate policy in EU agriculture could lie between -5% and 111% (Annex 2).

These studies assume the implementation of a strict EU mitigation policy in agriculture, usually simulated in these studies by imposing a hypothetical carbon levy on agricultural emissions. This has not been the case in practice until now. There is no EU-wide target for the reduction in agricultural emissions. EU agriculture has not been directly subject to mitigation policies such as carbon taxes or emissions trading schemes. Nor have animal numbers or fertiliser use been regulated directly as a climate measure. To date, specific measures to reduce emissions have been voluntary for farmers to implement, with compensation provided under the CAP. The greater ambition required of Member States by 2030 under the European Climate Law may lead to the introduction of more ambitious mitigation policies in agriculture than we have seen until now. Thus the issue of carbon leakage may become more salient in the future than it has been to date.

From a climate policy perspective, it is important to limit the extent of emissions leakage arising from mitigation actions because this undermines their effectiveness. Where leakage occurs through a loss in competitiveness arising from the application of stricter mitigation measures in the implementing country, such that domestic production is replaced by imports that do not face the same measures, there is also a case for intervention to level the playing field.

The EU has a portfolio of measures it can take to limit carbon leakage in agriculture, including both non-trade and trade policy interventions. Non-trade measures include subsidising mitigation measures in agriculture, compensating farmers for indirect emissions costs (e.g., through higher fertiliser prices), the use of carbon labelling, demand side measures to influence consumption, as well as the provision of financial assistance or development aid to partner countries to reduce the emissions intensity of their exports. The focus of this study is on potential trade policy interventions. Five potential trade policy interventions have been examined in detail:

- Mechanisms available under multilateral environmental agreements, and particularly the Paris Agreement.
- Tariff-based mechanisms implemented through non-reciprocal preferential trade agreements or voluntary free trade agreements.
- Extending the Carbon Border Adjustment Mechanism to agri-food products.
- Mandatory import standards.
- Mandatory due diligence provisions.

For trade policy measures, consistency with the EU's WTO commitments is an important requirement. Although this study does not go into the legal issues around the WTO consistency or otherwise of the specific trade policy measures, a fundamental and basic requirement is that the measures should not be discriminatory. This means, at a minimum, that measures cannot be applied to imports that do not also apply to EU producers.

MECHANISMS AVAILABLE UNDER MULTILATERAL ENVIRONMENTAL AGREEMENTS

The Paris Agreement under the UNFCCC is the primary multilateral agreement dealing with climate stabilisation. In addition to establishing agreed goals to stabilise the climate, it establishes several mechanisms and other commitments. These mechanisms and commitments offer a number of opportunities for the EU to influence the ambition of climate action in other countries, particularly developing countries, and thus to limit the extent of carbon leakage including in the agricultural area. The main opportunity is to help these countries to lower the emissions intensity of their agricultural production and exports. Here the relevant instruments are the Finance Mechanism and the Technology Mechanism.

The EU already contributes substantially to both of these Mechanisms but the extent to which the EU contribution targets agricultural mitigation is not clear. The mechanisms are demand-driven and the EU could work to encourage the recipient developing countries to give greater priority to reducing agricultural emissions. The EU could also encourage more specific actions in the agriculture and land use sectors in Parties' Nationally Determined Contributions when these are next updated in 2025. It will also be important to pursue efforts within the Codex Alimentarius Commission to promote sustainability standards for traded food products, including to help address the challenges posted by climate change. The challenge here is to define minimum standards that traded food products should meet to minimise their emissions footprint. This will require considerable preparatory work to help to define minimum standards that are appropriate and relevant across the globe and which can be enforced by official authorities. Such work could build on the growing number of voluntary sustainability standards that have been adopted by private actors such as traders, manufacturers, retailers and service providers (UNFSS 2022).

TARIFF-BASED MECHANISMS IMPLEMENTED THROUGH NON-RECIPROCAL PREFERENTIAL TRADE AGREEMENTS OR VOLUNTARY FREE TRADE AGREEMENTS

Tariff-based measures use the offer of a more privileged trade relationship with the EU to incentivise greater climate action in partner countries. They leverage preferential access to the EU market in return for commitments to more sustainable development pathways in trading partners, including climate action. To date, it would be hard to identify any positive impact on climate action in third countries arising from the EU's preferential trade arrangements.

Some recent initiatives by the Commission will make these provisions more demanding. Ratification of the Paris Agreement will be a requirement for eligibility for GSP preferences for some or all GSP beneficiaries (depending on the outcome of the inter-institutional negotiations). Importantly, if countries fail to implement their notified plan of action, this could be grounds for a complaint of non-compliance. Trade sanctions including the withdrawal of preferences are flagged in the case of FTA partners where there are serious violations by the partner country of its Paris Agreement commitments. Future trade agreements with G20 countries will require a common ambition to achieve climate neutrality. These changes will only come into effect over time, and it is too early to say what their practical impact will be.

Using trade preferences to incentivise climate action in partner countries is a two-edged sword. Recalling the objectives of trade policy measures set out at the beginning of this report, trade preferences are designed to reduce emissions in those countries that export to the EU and thus to reduce the consumption footprint of EU imports. However, free trade agreements are voluntarily negotiated between the parties. If the EU insists that its negotiating partner should make stronger commitments on climate and other sustainability issues, the partner in turn will likely demand greater market access concessions as the price of its agreement. By offering greater preferential access, the EU may incentivise its trading partners to take additional climate action but opening its own market to additional imports may adversely impact on the competitiveness of its domestic producers. In this case, there may be a trade-off between using trade policy to reduce the external climate footprint of EU consumption and avoiding the loss of competitiveness of EU producers arising from implementation of a stricter climate regime.

EXTENDING THE CARBON BORDER ADJUSTMENT MECHANISM TO AGRI-FOOD PRODUCTS.

At face value, the case for including agri-food products in the CBAM is not a strong one. The CBAM is tied to the EU's Emissions Trading System and is being introduced as an alternative to the free allocation of emissions allowances within the ETS to limit carbon leakage. Agriculture is not included in the ETS and neither does it face a carbon price on its emissions. It is possible that agriculture in future will face stricter climate regulations that may be equivalent to an implicit carbon price. The Commission plans by December 2023 to carry out a study to assess the potential of applying the polluter-pays principle to GHG emissions from agricultural activities. This could lead to agriculture being included in the future in a cap-and-trade scheme to reduce emissions which could open the possibility for discussions on a CBAM for food.

Even if this legal hurdle were overcome, there would be major practical problems in determining the appropriate level of embedded emissions in imported food products given the complexity of food supply chains where ingredients can be sourced from several countries all of whom may have climate policies with different levels of ambition. The potential severity of these practical problems will become clearer as experience is gained with the application of the CBAM levy to the narrower range of industrial products envisaged in the CBAM Regulation.

From an agricultural perspective, the extent to which application of a CBAM levy can address the loss of competitiveness for EU producers and subsequent carbon leakage if stricter mitigation policies including a price on emissions were implemented would be limited if provision is not made to rebate such a levy on exports. This is a controversial element in the inter-institutional negotiations on the Commission's CBAM proposal at the time of writing (November 2022) and the outcome is not yet known. One of the unknowns is the WTO compatibility of rebating charges paid on domestic emissions when goods are exported, particularly where the charges arise under a cap-and-trade scheme rather than a simple carbon tax. This issue will also likely be clarified in the coming years when the CBAM Regulation enters into force and depending on whether the EU is challenged on this by other WTO Members.

A CBAM could contribute to carbon leakage in agriculture through the input cost channel given that it is proposed to include fertiliser, an important agricultural input, in the CBAM. Assuming that the EU market price for fertilisers is largely determined by import competition and the price of imports, then if the price of imported fertiliser is increased by a CBAM levy, we would expect this to be reflected in the domestic price of fertilisers. Fertiliser prices at the time of writing (November 2022) have dramatically escalated over the past year due to the rising cost of natural gas. The CBAM would only be phased in from 2026 or 2027 (depending on the outcome of the inter-institutional negotiations) and it is not clear what market conditions will prevail in four or five years' time. Whether there is a case for further transitional assistance to help farmers adapt to higher fertiliser prices by changing to practices that reduce their dependence on inorganic fertiliser will need to be evaluated at that time.

MANDATORY IMPORT STANDARDS

Environmental standards generally do not impact on the characteristics of the product produced. They refer to the processes and methods used in its production. This means that they are governed by the WTO Technical Barriers to Trade Agreement. The principal requirement is that any import standards do not discriminate between domestic and imported products. Any requirements that are imposed on imports must, at a minimum, also apply to domestic producers. This limits the scope for import standards specifically relevant to climate policy given that, at the moment, no EU-wide climate standards are in force. Without identifying a standard that is mandatory for EU producers to apply, there is no basis to introduce import standards.

If, in the future, EU-wide climate standards are defined, applying the same standards to imported foodstuffs could be effective in achieving a level playing field for EU producers with respect to competition on the EU market. However, its overall impact in reducing carbon leakage and reducing global emissions may be limited. An import standard does not level the playing field for EU exports. It is conceptually possible (if legally disputed) to level the playing field for exports in the case of a CBAM by rebating any domestic levy or tax when a product is exported, but this is not a possibility even in principle when considering an import standard. The other mechanism that can limit the effectiveness of import standards in reducing global emissions is the risk that an EU import standard may only redirect higher emission exported products toward those countries with less stringent regulations (referred to as *resource shuffling*). A possible solution would be

to accompany the import standard with cooperation agreements with exporting countries to ensure that all their exported products meet the required standards. Such partnership agreements are foreseen as a part of mandatory due diligence measures around deforestation.

MANDATORY SUSTAINABILITY DUE DILIGENCE PROVISIONS

Due diligence initiatives are an increasingly important component of the EU trade policy toolkit. From a climate perspective, the most important initiative is the proposed regulation on deforestation-free supply chains. This will set mandatory due diligence rules for operators which place specific commodities on the EU market that are associated with deforestation and forest degradation – soy, beef, palm oil, wood, cocoa and coffee and some derived products, such as leather, chocolate and furniture – though the final list will be decided in the inter-institutional negotiations underway at the time of writing (November 2022).

The initiative on deforestation-free supply chains highlights some lessons that may also be applicable if this trade policy instrument were extended to other climate-related requirements. There is general agreement that the required actions by companies should be situated within a wider context of partnership agreements with exporting countries. The objective is not simply to clean up EU supply chains, but ultimately to influence the supply-side drivers of deforestation in these countries. This also addresses the risk of reshuffling, where the products exported to the EU meet demanding EU standards and exports that do not meet EU standards are diverted to other markets.

Another lesson from the deforestation-free supply chain regulation is that there has been considerable international focus on this issue for several decades and a clear international consensus has been building on the need to address this issue. It is easier to introduce a unilateral measure to pursue a climate objective when strong commitments have been made at the international level.

A key legislative initiative for climate-related action in the future will be the Directive on Corporate Sustainability Due Diligence proposed by the Commission in February 2022. This also builds on international efforts to develop international standards on corporate sustainability due diligence.[58] It is closely related to another proposal for a Corporate Sustainability Reporting Directive. It sets out a corporate due diligence duty to identify, prevent, bring to an end, mitigate and account for adverse human rights and environmental impacts in the company's own operations, its subsidiaries and their value chains. The legislation covers both potential adverse human rights and environmental impacts that are identified in an Annex to the Directive. With respect to climate, the new proposal requires the large and listed companies covered by the Directive to adopt a plan to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement. The plan would have to identify the extent to which climate change poses a risk to or has an impact on a company's operations. In case climate change is identified as posing a 'principal risk' for, or as having a 'principal impact' on, a company's operations, the company should include emissions reduction objectives in its plan. Companies will be required to take account of the fulfilment of obligations regarding the corporate climate change plan when setting any variable remuneration linked to the contribution of a director to the company's business strategy and long-term interests and sustainability. The Directive also requires Member States to adapt their rules on civil liability to cover cases where damage results from failure by a company to comply with due diligence obligations. Agriculture and food companies with more than 250 employees on average and with a net worldwide turnover of more than €40 million would be covered by this directive.

At the time of writing (November 2022) this proposal is being considered by the co-legislators. Environmental NGOs have welcomed the legislation but have also asked for it to be strengthened, particularly with respect to the climate action obligations of businesses. These are spelled out in a specific article (Article 15) that refers to combating climate change. Issues raised include limitations in the coverage of companies covered by this obligation, lack of clarity whether indirect emissions are covered or not, the absence of reference to the Paris Agreement and climate impacts in the Annex listing the environmental damages that should be prevented and mitigated, the implicit restriction that only companies for whom climate change is a 'principal risk' or has a 'principal impact' are required to set emissions reduction objectives, and the absence of

58 These include the 2011 United Nations Guiding Principles on Business and Human Rights, the ILO Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, and the OECD Guidelines for Multinational Enterprises and related Guidance on Responsible Business Conduct. The OECD framework extended the application of due diligence to cover environmental harm.

any guidance or criteria on what an emissions reduction plan should include.[59] It is particularly important that Scope 3 emissions fall within the definition of "a company's operations" because as much as 90% of a company's carbon footprint comes from its Scope 3 emissions.

The significance of this legislation is that it introduces a legal obligation on companies to address the climate impact of their activities. The impact on carbon leakage will be indirect. Companies, such as supermarkets, will have emissions reduction targets. They will source supplies both from domestic producers and from imports. If EU-sourced products have a lower carbon footprint, this will encourage a shift to domestic sourcing in order to fulfil their emissions reduction plans. In any event, companies will have an incentive to invest in reducing the emissions footprint of imported as well as domestic products in order to achieve their reduction targets. A reduction the emissions intensity of imports in itself will reduce the extent of carbon leakage.

RECOMMENDATIONS

Based on the analysis in this report, the following recommendations are put forward regarding the use of trade-related policy instruments to limit carbon leakage in the agricultural sector, assuming that the sector will be required to meet more ambitious mitigation targets in the future than has been the case to date. Recall that there are two ways to reduce carbon leakage arising from mitigation action in agriculture. One is to offset any loss of competitiveness for domestic producers by requiring imports to either pay a similar levy or tax that might be levied on domestic producers (the CBAM proposal) or to meet either minimum climate-relevant requirements (that might be set by the Codex Alimentarius Commission) or to meet similar regulatory standards imposed on EU producers (import standards). The other is to seek to reduce the emissions intensity of imported products (by encouraging more ambitious climate action in agriculture in third countries, also using the financial and technology transfer mechanisms under the Paris Agreement, by granting tariff preferences in trade agreements, or by strengthening mandatory due diligence requirements). These two approaches can be complementary and are not mutually exclusive. For example, the measures that would restrict imports can also provide an incentive to exporters to reduce the emissions intensity of their exports, depending on how they are designed. Also, measures to reduce the emissions intensity of the exports of trading partners may lead to an increase in their production costs, which would reduce the competitiveness pressure on EU producers.

The other important point to bear in mind is that, to be compatible with the EU's obligations under the WTO Agreements, a minimum requirement is that trade measures must not be discriminatory. In other words, any measure that affects agri-food imports can only be justified if this measure also applies to EU farmers. At present, there are no EU-wide obligations or regulations imposed on EU farmers requiring the mitigation of greenhouse gases. Emissions reduction is pursued through the CAP and national measures through voluntary measures that compensate farmers for any additional costs incurred. This clearly limits the scope for introducing trade policy measures to limit any leakage that might arise from these measures.

1. Carbon leakage arises because of differences in the ambition of countries' climate policies. To the extent that other countries 'raise their game' carbon leakage is reduced. **Multilateral initiatives** are important in this respect. The EU should continue to invest in its diplomatic efforts to raise the level of ambition in Parties' Nationally Determined Contributions particularly with respect to mitigation in the agriculture and land sectors. The next COP27 in Egypt in November 2022 is likely to have a particular focus on mitigation in these sectors. The global stocktake under the Paris Agreement currently underway also provides an opportunity to argue for higher ambition in the next round of NDCs to be proposed in 2025. As carbon leakage arises because of differences in the ambition of climate action across countries, any strengthening of agriculture and land use commitments in NDCs will help to reduce carbon leakage. In future updates to its NDC the EU could introduce specific commitments around reductions in agricultural and food system emissions in addition to its existing commitments around emissions and removals from land use in order to provide the necessary leadership. The EU's credibility in arguing for greater focus on agricultural and land mitigation in other countries will be influenced partly by its domestic action but also by its willingness to support mitigation action particularly in developing countries through the financial and technology transfer mechanisms of the Paris Agreement.

59 For example, see Client Earth, Factsheet - Environment and Climate: Corporate Sustainability Due Diligence Directive, June 2022 and European Coalition for Corporate Justice, European Commission's proposal for a directive on Corporate Sustainability Due Diligence, April 2022.

2. The EU has indicated that it wishes to see sustainability standards, including climate standards, included in the work programme of the **Codex Alimentarius Committee**. This will require intensive preparatory work, including on the possible design of minimum standards that would be broadly accepted by the very diverse membership. Resources will need to be allocated to this task.

3. The EU has recently reinforced the way it will use **trade preferences** to incentivise greater climate ambition in its partner countries. As trade agreements are only negotiated or upgraded infrequently, time will need to be given to see whether these strengthened measures will deliver the desired impact. This will require the political willingness to use the stronger instruments when it is justified. Granting additional trade preferences to countries in return for stronger climate commitments may incentivise the EU's trading partners to take additional climate action but opening its own market to additional imports may adversely impact the competitiveness of its domestic producers.

4. **Mandatory corporate sustainability due diligence** is a relatively new instrument with trade policy consequences. It puts the onus on companies to ensure that their activities do not cause adverse impacts on human rights or the environment. Legislation proposed by the Commission will require large and listed companies to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement. Legislation is also proposed that will require operators to ensure that for a group of mainly agricultural forest-risk commodities only deforestation-free and legal products (according to the laws of the country of origin) are placed on the EU market. Both pieces of legislation are under negotiation between the co-legislators at the time of writing (November 2022) and the precise coverage and obligations that will be established are not yet finalised. For the Directive on Corporate Sustainability Due Diligence, it is particularly important that Scope 3 emissions fall within the definition of "a company's operations" because as much as 90% of a company's carbon footprint comes from its Scope 3 emissions. If EU-sourced products have a lower carbon footprint, this will encourage a shift to domestic sourcing in order to fulfil their emissions reduction plans.

5. **Mandatory import standards** (sometimes called 'mirror clauses') have been advocated as a way to ensure that imported agri-foods meet the same standards as If EU-sourced products have a lower carbon footprint, this will encourage a shift to domestic sourcing in order to fulfil their emissions reduction plans required of EU producers. Where standards apply to EU producers (e.g. restrictions on the use of particular pesticides), similar standards could be applied to imports. Conversely, under WTO rules, any requirements that are imposed on imports must, at a minimum, also apply to domestic producers. This limits the scope for import standards specifically relevant to climate policy given that, at the moment, no EU-wide climate standards specific to farmers are in force. Without identifying a standard that is mandatory for EU producers to apply, there are no grounds to introduce import standards. Such standards may be developed in future in response to the greater urgency to reduce emissions introduced by the European Climate Law. However, an import standard cannot avoid carbon leakage if climate policy makes exports more expensive, leading to a loss in global market share. Also, an import standard is open to the risk that it may redirect higher emission exported products toward those countries with less stringent regulations while compliant exports are sent to the EU. A possible solution would be to accompany the import standard with cooperation agreements with exporting countries to ensure that all their exported products meet the required standards.

6. A **carbon border adjustment (CBAM) levy** on agri-food products would be possible only if the production of agri-food products in the EU were subject to a carbon tax or similar charge such as under a cap-and-trade system. This is not the case at present, so a CBAM for agri-food products is not feasible. If agricultural emissions were subject to a levy in the future, it would open the possibility for a similar levy to be applied on imports. Even if a CBAM levy on imports were legally possible, there would be significant practical issues in applying it to agri-food imports. The experience gained with applying a CBAM levy to the initial group of five industrial products, plus any extension to other products after 2026, will be informative on how easily these administrative and enforcement issues can be overcome. Given the important role of agri-food exports in the EU, a carbon levy on imports alone is unlikely to be effective in preventing carbon leakage. The possibility to rebate any domestic carbon tax or levy if a product is exported is under discussion in the inter-institutional negotiations on CBAM. The outcome will have

great significance if agri-food products were covered by such a charge in the future.

7. The inclusion of **fertilisers** in the EU CBAM proposal will lead to an increase in the price of imported fertilisers and thus in the EU market price for fertilisers. As the European Parliament has recognised, it is appropriate that the embedded emissions in using fertiliser should be reflected in its market price. This provides a necessary signal to the industry to seek to reduce emissions and to farmers to look for alternative ways to maintain soil fertility. Fertiliser prices at the time of writing (November 2022) have dramatically escalated over the past year due to the rising cost of natural gas. The CBAM would only be phased in from 2026 or 2027 (depending on the outcome of the inter-institutional negotiations) and it is not clear what market conditions will prevail in four or five years' time. Whether there is a case for further transitional assistance to help farmers adapt to higher fertiliser prices by changing to practices that reduce use of chemical fertiliser will need to be evaluated at that time.

8. If there is resort to trade policy measures to limit carbon leakage in the future, it will be important to take account of the concerns of **developing countries** in the design of these measures. The principle of 'common but differentiated' responsibilities is included in the Paris Agreement, meaning that countries are not expected to pursue the same level of climate ambition if they have different capabilities. Trade policy measures to limit carbon leakage should take account of this principle, bearing in mind the WTO principle of non-discrimination. At a minimum, the particular interests of the least-developed countries should be considered in the design of trade policy instruments.

9. The impact of the several legislative initiatives to be implemented in the next few years on the level and trend of emissions embedded in agri-food imports into the EU should be monitored. These data are an essential input when attempting to calculate **the trend in EU consumption emissions** as opposed to the territorial emissions reported to the UNFCCC. The main efforts to estimate consumption emissions currently focus on CO_2 emissions only and do not properly account for the GHGs associated with agricultural emissions (CH_4 and N_2O) or the CO_2 emissions associated with land use, land use change and forestry.[60] The EU's Joint Research Centre should be encouraged to devote resources to filling this gap.

10. The focus of this report is on bringing about greater coherence between trade and climate policy in mitigating agricultural emissions. However, unilateral trade policy measures may not be feasible or may not be helpful in minimising carbon leakage arising from more ambitious climate action to reduce EU agricultural emissions. **Greater attention should be paid to potentially more effective approaches**. Making available a wider range of mitigation technologies to EU farmers by ramping up research and innovation investment, ensuring a complementary reduction in demand for high-emission agricultural products if climate action leads to reduced production of these products within the EU, and using international diplomacy to encourage more ambitious climate action in third countries and trading partners, can be more successful strategies to minimise carbon leakage in agriculture in the future.

60 For example, the Eurostat system of consumption accounts only considers CO_2 emissions. Similarly, the OECD work on consumption-based emissions and emissions embedded in trade only considers CO2 emissions excluding LULUCF emissions.

REFERENCES

Aleksandrowicz, Lukasz, Rosemary Green, Edward J. M. Joy, Pete Smith, and Andy Haines. 2016. "The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review." *PLOS ONE* 11 (11): e0165797. https://doi.org/10.1371/journal.pone.0165797.

Alliance Environnement, and Directorate-General for Agriculture and Rural Development (European Commission). 2021. *Evaluation Support Study on the Impact of the CAP on Sustainable Management of the Soil*: Final Report. Luxembourg: Publications Office of the European Union.

Alliance Environnment. 2019. *Evaluation Study of the Impact of the CAP on Climate Change and Greenhouse Gas Emissions.* Brussels: European Commission, Directorate-General for Agriculture and Rural Development.

Arvanitopoulos, T., G. Garsous, and P. Agnolucci. 2021. "Carbon Leakage and Agriculture: A Literature Review on Emissions Mitigation Policies." OECD Food, Agriculture and Fisheries Paper no. 169. Paris: OECD.

Barreiro-Hurle, J., M. Bogonos, M. Himics, J. Hristov, I. Pérez Domínguez, A. Sahoo, G. Salputra, F. Weiss, E. Baldoni, and C. Elleby. 2021. *Modelling Environmental and Climate Ambition in the Agricultural Sector with the CAPRI Model.* Luxembourg: Publications Office of the European Union.

Blandford, D., and K. Hassapayannes. 2015. "The Common Agricultural Policy in 2020: Responding to Climate Change." In *Research Handbook on EU Agriculture Law*, edited by J. McMahon and M. Cardwell. Cheltenham, UK: Edward Elgar Publishing.

CAN Europe. 2021. *Common Agricultural Policy (CAP); Will CAP Strategic Plans Help Deliver Much Needed Climate Action?* Brussels.

CE Delft. 2016. *Calculation of Additional Profits of Sectors and Firms from the EU ETS 2008-2015*. Report Commissioned by Carbon Market Watch. Delft.

Chen, Kaijie, Tao Huang, Xiaodong Zhang, Xinrui Liu, Xiaohu Jian, Ruiyu Zhugu, Linfei Wang, et al. 2022. "Drivers of Global Methane Emissions Embodied in International Beef Trade." *Environmental Science & Technology* 56 (16): 11256–65. https://doi.org/10.1021/acs.est.2c03509.

Clay, J. 2016. *Codex Planetarius: Maintaining the Environmental Sustainability of Food Production*. WWF US.

Clora, Francesco, Wusheng Yu, Gino Baudry, and Luís Costa. 2021. "Impacts of Supply-Side Climate Change Mitigation Practices and Trade Policy Regimes under Dietary Transition: The Case of European Agriculture." *Environmental Research Letters* 16 (12): 124048. https://doi.org/10.1088/1748-9326/ac39bd.

Copenhagen Economics. 2015. *Carbon Leakage in the Nitrogen Fertilizer Industry*. Brussels: Fertilizers Europe.

Di Maria, Corrado, and Edwin van der Werf. 2008. "Carbon Leakage Revisited: Unilateral Climate Policy with Directed Technical Change." *Environmental and Resource Economics 39* (2): 55–74. https://doi.org/10.1007/s10640-007-9091-x.

ECA. 2021. *Common Agricultural Policy and Climate: Half of EU Climate Spending but Farm Emissions Are Not Decreasing.* Special report 16/2021. Luxembourg: European Court of Auditors.

EEA. 2021. *Trends and Projections in Europe 2021*. Report No 13/2021. Copenhagen: European Environment Agency.

European Commission. 2017. *Trade and Sustainable Development (TSD) Chapters in EU Free Trade Agreements (FTAs).* Non-Paper of the Commission Services. Brussels,: http://trade.ec.europa.eu/doclib/docs/2017/july/tradoc_155686.pdf.

———. 2018a. *A Clean Planet for All: A European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy*. COM(2018) 773. Brussels.

———. 2018b. *Feedback and Way Forward on Improving the Implementation and Enforcement of Trade and Sustainable Development Chapters in EU Free Trade Agreements.* Non-Paper of the Commission Services. Brussels: http://trade.ec.europa.eu/doclib/docs/2018/february/tradoc_156618.pdf.

———. 2019. *Communication from the Commission to the European Parliament, the Council, the European, Economic and Social Committee and the Committee of the Regions, Stepping up EU Action to Protect and Restore the World's Forests.* COM(2019) 352. Brussels.

———. 2020. *Impact Assessment Accompanying the Document "Communication Fromthe Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Stepping up Europe's 2030 Climate Ambition Investing in a Climate-Neutral Future for the Benefit of Our People."* SWD(2020) 176. Brussels.

———. 2021a. *Impact Assessment Minimising the Risk of Deforestation and Forest Degradation Associated with Products Placed on the EU Market.* SWD(2021) 326. Brussels.

———. 2021b. *Impact Assessment Report Accompanying the Document Proposal for a Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism*. SWD(2021) 643, Part 2, Annex 11. Brussels.

———. 2021c. *Proposal for a Regulation of the European Parliament and of the Council on the Making Available on the Union Market as Well as Export from the Union of Certain Commodities and Products Associated with Deforestation and Forest Degradation and Repealing Regulation (EU) No 995/2010*. COM(2021) 706. Brussels.

———. 2021d. *Proposal for a Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism*. COM(2021) 564. Brussels.

———. 2021e. *Sustainable Carbon Cycles*. COM(2021) 800. Brussels.

———. 2021f. *Trade Policy Review - An Open, Sustainable and Assertive Trade Policy*. COM(2021) 66. Brussels.

———. 2022a. *Application of EU Health and Environmental Standards to Imported Agricultural and Agri-Food Products.* Brussels.

———. 2022b. *The Power of Trade Partnerships: Together for Green and Just Economic Growth.* COM(2022) 409. Brussels.

FAO. 2021. *Assessing Policy Gaps and Opportunities in the Nationally Determined Contribution: A Sectoral Methodology for Agriculture and Land Use*. Environment and Natural Resources Management Working Paper 86. Rome, Italy: Food and Agriculture Organisation of the United Nations.

Frank, Stefan, Petr Havlík, Andrzej Tabeau, Peter Witzke, Esther Boere, Mariia Bogonos, Andre Deppermann, et al. 2021. "How Much Multilateralism Do We Need? Effectiveness of Unilateral Agricultural Mitigation Efforts in the Global Context." *Environmental Research Letters* 16 (10): 104038. https://doi.org/10.1088/1748-9326/ac2967.

Friedlingstein, P, M W Jones, M O'Sullivan, R M Andrew, J Hauck, G P Peters, W Peters, et al. 2019. "Global Carbon Budget 2019." *Earth System Science Data* 11 (4): 1783–1838. https://doi.org/10.5194/essd-11-1783-2019.

Gerlagh, Reyer, and Onno Kuik. 2014. "Spill or Leak? Carbon Leakage with International Technology Spillovers: A CGE Analysis." *Energy Economics* 45 (September): 381–88. https://doi.org/10.1016/j.eneco.2014.07.017.

Golub, Alla A., Benjamin B. Henderson, Thomas W. Hertel, Pierre J. Gerber, Steven K. Rose, and Brent Sohngen. 2013. "Global Climate Policy Impacts on Livestock, Land Use, Livelihoods, and Food Security." *Proceedings of the National Academy of Sciences* 110 (52): 20894–99. https://doi.org/10.1073/pnas.1108772109.

Himics, Mihaly, Thomas Fellmann, Jesús Barreiro-Hurlé, Heinz-Peter Witzke, Ignacio Pérez Domínguez, Torbjörn Jansson, and Franz Weiss. 2018. "Does the Current Trade Liberalization Agenda Contribute to Greenhouse Gas Emission Mitigation in Agriculture?" *Food Policy* 76 (April): 120–29.

HM Treasury. 2021. *Net Zero Review: Analysis Exploring the Key Issues*. London.

Hong, Chaopeng, Hongyan Zhao, Yue Qin, Jennifer A. Burney, Julia Pongratz, Kerstin Hartung, Yu Liu, et al. 2022. "Land-Use Emissions Embodied in International Trade." *Science* 376 (6593): 597–603. https://doi.org/10.1126/science.abj1572.

IPCC. 2022. *Chapter 7: Agriculture, Forestry and Other Land Uses (AFOLU), Working Group III Contribution to the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC).*

Jansson, T., I. Nordin, F. Wilhelmsson, P. Witzke, G. Manevska-Tasevska, F. Weiss, and A. Gocht. 2021. "Coupled Agricultural Subsidies in the EU Undermine Climate Efforts." *Applied Economic Perspectives and Policy* 43 (4): 1503–19.

Low, P., G. Marceau, and J. Reinaud. 2011. *The Interface between the Trade and Climate Regimes: Scoping the Issues*. Staff Working Paper ERSD-2011-1. Geneva: World Trade Organisation.

Mattauch, Linus, Cameron Hepburn, Fiona Spuler, and Nicholas Stern. 2022. "The Economics of Climate Change with Endogenous Preferences." *Resource and Energy Economics* 69 (August): 101312. https://doi.org/10.1016/j.reseneeco.2022.101312.

Nordin, I., F. Wilhelmsson, T. Jansson, T. Fellmann, J. Barreiro-Hurle, and M. Himics. 2019. "Impact of Border Carbon Adjustments on Agricultural Emissions – Can Tariffs Reduce Carbon Leakage?" In *172nd EAAE Seminar 'Agricultural Policy for the Environment or Environmental Policy for Agriculture?* Brussels.

O.J. 2021a. "Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 Establishing the Framework for Achieving Climate Neutrality and Amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')." *Official Journal* L 243: 1–17.

———. 2021b. "Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 Establishing Rules on Support for Strategic Plans to Be Drawn up by Member States under the Common Agricultural Policy (CAP Strategic Plans) and Financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and Repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013." *Official Journal* L 435: 1–186.

Pauwelyn, Joost, and David Kleimann. 2020. "Trade Related Aspects of a Carbon Border Adjustment Mechanism." Brussels: European Parliament, Policy Department, Directorate-General for External Policies.

Pendrill, F., U.M. Persson, and T. Kastner. 2020. "Deforestation Risk Embodied in Production and Consumption of Agricultural and Forestry Commodities 2005-2017." Zenodo. 2020. https://zenodo.org/record/4250532.

Pérez Domínguez, I., T. Fellmann, F. Weiss, P. Witzke, J. Barreiro-Hurlé, M. Himics, T. Jansson, G. Salputra, and A. Leip. 2016. *An Economic Assessment of GHG Mitigation Policy Options for EU Agriculture (EcAMPA 2)*. Joint Research Centre Institute for Prospective Technological Studies. Luxembourg: Publications Office of the European Union.

Pérez Domínguez, I., T. Fellmann, P. Witzke, F. Weiss, Jordan Hristov, M. Himics, J. Barreiro-Hurlé, M. Gomez Barbero, and A. Leip. 2020. *Economic Assessment of GHG Mitigation Policy Options for EU Agriculture: A Closer Look at Mitigation Options and Regional Mitigation Costs (EcAMPA 3)*. Luxembourg: Publications Office of the European Union.

Ricardo. 2022. *Trade Policies and Emissions Reduction: Establishing and Assessing Options, Agriculture and Deforestation, Progress Report for Climate Change Committee*. Harwell, Oxfordshire: Ricardo Energy & Environment.

Sandström, V., H. Valin, T. Krisztin, P. Havlík, M. Herrero, and T. Kastner. 2018. "The Role of Trade in the Greenhouse Gas Footprints of EU Diets." *Global Food Security* 19: 48–55.

UNFSS. 2022. *UNFSS 5th Flagship Report, Voluntary Sustainability Standards (VSS), Sustainability Agenda, and Developing Countries: Opportunities and Challenges.* New York: United Nations Forum on Sustainability Standards.

Van Doorslaer, B., P. Witzke, I. Huck, F. Weiss, T. Fellmann, G. Salputra, T. Jansson, D. Drabik, and A. Leip. 2015. *An Economic Assessment of GHG Mitigation Policy Options for EU Agriculture*. Seville: Joint Research Centre, Institute for Prospective Technological Studies.

WTO. 2022. *Climate Change and International Trade*. World Trade Report 2022. Geneva: World Trade Organisation.

Xue, Li, Zhi Cao, Silvia Scherhaufer, Karin Östergren, Shengkui Cheng, and Gang Liu. 2021. "Mapping the EU Tomato Supply Chain from Farm to Fork for Greenhouse Gas Emission Mitigation Strategies." *Journal of Industrial Ecology* 25 (2): 377–89. https://doi.org/10.1111/jiec.13080.

ANNEX 1. TERMS OF REFERENCE

The subject of the study is how to reduce/avoid carbon leakage as we increase our climate ambition in the EU. Generally speaking, this can be done in two ways, one by making policy decisions that affect EU farmers and EU citizens or two by adjusting trade policy to influence how our trading partners produce. In order to be successful both approaches are vitally important. However, as considerable academic attention is being given to the former, this study will exclusively focus on the latter. Different options will be looked at to reduce the percentage of carbon leakage, these may include things like incentives for our trade partners, binding clauses in trade agreements or taxes.

ANNEX 2. SUMMARY OF SELECTED STUDIES ON CARBON LEAKAGE IN EU AGRICULTURE

This annex summarises the methodologies and findings of academic studies that assess the possible leakage effects of climate policy in EU agriculture. The range of estimates is very wide. The conceptual reasons why leakage estimates can differ are explored in the main text. In addition to these conceptual reasons, estimates may differ due to methodological differences between the studies. Studies differ in the type of simulation model used (partial or general equilibrium), their baselines including the assumptions on the evolution of diets, in the time horizons they consider, in the scope of GHGs covered especially whether carbon stock changes due to land use change are included or not, in the scope of mitigation technologies they include, and in the scenarios modelled including the assumed level of carbon tax. All studies use a stylised approach to simulating mitigation policy by assuming that a carbon tax rate is levied directly on GHG emissions. This is assumed to incentivise the uptake of emission reduction options including changes in activity levels as otherwise a cost per ton GHGs emitted needs to be paid. The mitigation options are taken up as long as the economic benefits (avoided carbon price payments) outweigh the costs of adoption. This stylised approach abstracts from the many measurement and verification issues that would arise in practice if implementing a carbon tax on agricultural emissions. The following table summarises the findings of the studies reviewed. (Table 2)

Van Doorslaer et al., 2015 (EcAMPA 1)

The project "Economic assessment of GHG mitigation policy options for EU agriculture" (EcAMPA) is managed by the EU Joint Research Centre. The first report of EcAMPA was published by Van Doorslaer et al. (2015), followed by EcAMPA 2 (Pérez Domínguez et al. 2016) and subsequently EcAMPA 3 (Pérez Domínguez et al. 2020). The modelling tool used for the EcAMPA studies is the Common Agricultural Policy Regional Impact Analysis (CAPRI) model. A key contribution of the EcAMPA project has been the implementation of specific endogenous GHG mitigation technologies in the CAPRI model.

It is important to emphasise in reviewing empirical studies of carbon leakage that use the CAPRI (Common Agricultural Policy Regional Impact) model that efforts to include land use change (including deforestation) in either EU or non-EU countries were only begun with the Joint Research Centre EcAMPA 3 project (Pérez Domínguez et al. 2020) and this work is ongoing.

In the EcAMPA 1 study, to investigate the impact of introducing mandatory targets for GHG reduction in agriculture, a total of six scenarios were built. Two values for GHG emission caps were set (at MS level), requiring reductions of agricultural GHG emissions of 19% or 28% respectively by 2030 compared to

Table 2. Carbon leakage estimates from EU climate action in agriculture

Study	Scenario	Estimated leakage rates
Van Doorslaer et al., 2015 (EcAMPA 1)	Mandatory reduction targets of either 19% or 28% in EU agriculture emissions in 2030 compared to 2005. Only subsidies to adopt technological mitigation measures	64-91% leakage in mandatory reduction scenarios. Small or even negative leakage rates in subsidy scenarios
Pérez Domínguez et al., 2016 (EcAMPA2)	Mandatory reduction targets of 15%, 20% and 25% in EU agriculture emissions in 2030 compared to 2005. 80% subsidy to adopt mitigation measures with or without mandatory targets	23-35% leakage rate in the mandatory scenarios. Subsidising adoption of mitigation measures reduces leakage rates with mandatory targets, and subsidies alone could lead to a negative leakage rate of -5%.
Himics et al., 2018	Assumes a carbon tax of 50 €/t CO_2e on agricultural non-CO_2 emissions in the EU. Combines tax with a trade liberalisation scenario	21% leakage rate with carbon tax alone, increasing to 50% if combined with EU trade liberalisation.
Barreiro-Hurle et al., 2021	Models several targets in the EU Farm to Fork Strategy	64% leakage rate
Nordin et al., 2019	Carbon tax of €120/C0$_2$e in 2030, no access to mitigation technologies	111% leakage rate
Jansson et al., 2021	Reduced EU emissions due to removal of voluntary coupled support	74% leakage rate
Henderson and Verma, 2021	Carbon tax of USD 100/t CO_2e in 2050 imposed by northern European countries with and without adoption of mitigation technologies	108% in absence of mitigation technologies, 59% if farmers assumed to have access to mitigation technologies.
Frank et al., 2021	Carbon tax of 245 USD/t CO_2e in 2050 using three different models	Average leakage rate 40% (27%-56%) with unilateral EU climate action.
Clora et al, 2021	Assumed adoption of supply-side extensification strategies in EU agricultural production with and without trade liberalisation	48% leakage rate, increased to 52% if EU liberalises agricultural trade.

Source: Own construction.

the year 2005. For each of the two cap values, scenarios simulate either a homogenous distribution of emission caps, meaning that each Member State has the same reduction target, without trade in emission permits (HOM19 and HOM28) or with trade in emission permits (HOM19ET and HOM28ET). Furthermore, a heterogeneous distribution of emission caps (HET19 and HET28) is modelled, in which Member State targets are based on the distribution key of the Effort Sharing Decision.

These scenarios with mandatory targets were contrasted with alternative scenarios without mandatory targets but instead introducing subsidies for the voluntary uptake of the technological mitigation measures. Three scenarios with subsidies of 30% (SUBS30), 60% (SUBS60) and 90% (SUBS90) were tested.

In the six scenarios with mandatory targets, the reduction achieved in EU emissions is either 19% or 28% by design. However, the share of those emissions that are offset by increased emissions in non-EU countries is high, between 64% and 91% according to the scenario. As a result, there is only a very small fall in global emissions. The subsidy scenarios achieve much smaller reductions in EU emissions (between 0.5% and 5%) but, to compensate, there is no leakage or even small negative leakage.

In the CAPRI model producers meet the emissions cap either by reducing emissions intensities or by cutting production. If there are no commensurate decreases in demand, the latter effect must be offset by increasing imports, which is the source of leakage. In any ex ante simulation model, the division of a mandatory emissions reduction target between changes in production and changes in emissions factors will depend on the mitigation technologies and practices that are included in the model. The importance of the ability to achieve reductions in emissions intensities can be shown by assuming that emissions in the EU would be reduced by one unit of CO_2e achieved by production decreases alone, assuming unchanged consumer preferences. According to the EcAMPA 1 study, leakage rates

considering just agricultural emissions would then increase to between 140% and 160%, and could be even higher if emissions related to agriculture, such as land use change, were included in the analysis.

Among the lessons that can be drawn regarding leakage from the EcAMPA 1 study are the following:

- higher emission targets do not necessarily lead to higher global mitigation, because EU Member States first tend to exhaust options to reduce emission intensities, while further reductions are achieved via production cuts. Because higher EU reduction targets are achieved more via production cuts which lead to higher leakage, the change in global emissions as the level of EU ambition is increased hardly changes.

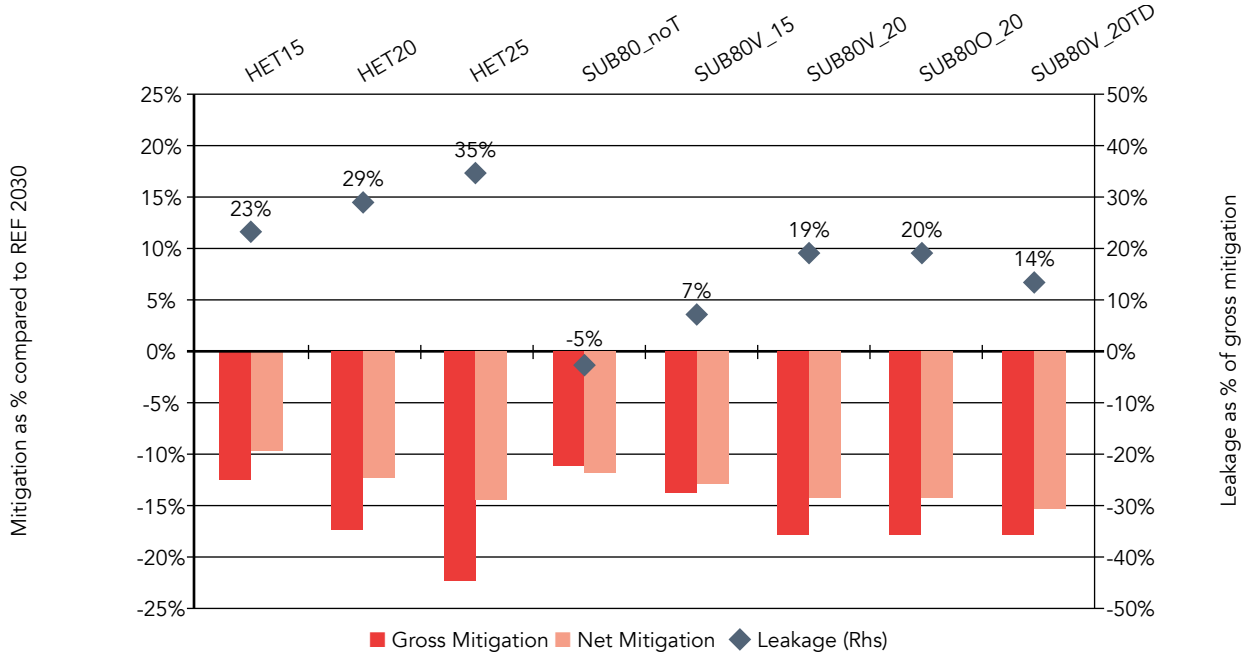
- The results suggest that subsidies that impact on emission intensities might achieve similar global reductions as mandatory reductions. In contrast to the scenarios with mitigation targets, the subsidy scenarios (SUBS30, SUBS60, SUBS90), do not lose mitigation achievements via emission leakage and may even have small negative leakage effects. Because in the SUB scenarios mitigation is achieved via reduced emission intensities rather than decreased EU production, no additional imports are triggered. However, offering subsidies for technological mitigation measures alone is likely to be insufficient to achieve emission reduction targets of 20-30%.

- Allowing emissions trading generally dampens leakage rates, leading to 13% less leakage than the equivalent scenarios without tradable permits. Under an emissions trading scheme, regions with low marginal abatement costs sell permits to regions with high marginal abatement costs, leading to an efficient allocation of the mitigation burden, which by extension reduces the need for imports and thus attenuates leakage.

- Beef and other animal products are responsible for more than 90% of additional emissions outside the EU in all scenarios considering just agricultural emissions. If land use change emissions are also included, the role of crops becomes more important although much of the demand for crops is driven by the demand for animal feed.

The EcAMPA 1 study notes several limitations that have been addressed in the further development of the EcAMPA project. Only a restricted number of mitigation technologies are included in the model, so requiring more of the mitigation to be achieved through production cuts and thus exacerbating leakage rates. No improvement in emissions intensity in non-EU regions over time is assumed which again would tend to over-estimate leakage rates. On the other hand, the model does not include land use change emissions due to any expansion of production in non-EU countries which leads to an underestimation of leakage rates.

Figure C: Emission leakage per scenario (%-changeto reference scenario, 2030)



Source: Pérez Domínguez et al., 2016.

Pérez Domínguez et al., 2016 (EcAMPA2)

Several scenarios were evaluated in the ECAMPA 2 study (Pérez Domínguez et al. 2016).

- Three scenarios (HET15, HET20 and HET25) which have a compulsory mitigation reduction target for EU agriculture of 15%, 20% and 25% in 2030 compared to 2005, respectively, distributed across Member States according to cost effectiveness and assuming restricted potential of mitigation technologies.

- Two scenarios (SUB80V_15, SUB80V_20) which have a compulsory mitigation target for EU agriculture of 15% and 20%, respectively, distributed across Member States according to cost effectiveness, assuming restricted potential of mitigation technologies and with an 80% subsidy for the voluntary adoption of mitigation technologies.

- One scenario (SUB80V_20TD) with a 20% mitigation target, an 80% subsidy for the voluntary adoption of mitigation technologies and 'unrestricted' potential of the mitigation technologies (i.e. more rapid technological development).

- One scenario (SUB80O_20) with a 20% mitigation target and an 80% subsidy for the mandatory adoption of selected mitigation technologies and for the voluntary adoption of the remaining technologies.

- One scenario (SUB80V_noT) with no specific mitigation target for EU agriculture but with an 80% subsidy for the voluntary adoption of mitigation technologies.The leakage rate for the various scenarios as calculated for the year 2030 is shown in the figure above. Results show that an increase in the EU mitigation target generally goes along with an increase in emission leakage, with 23% (HET15), 29% (HET20) and 35% (HET25) of the mitigation achieved in the EU offset by emission increases in the rest of the world. With higher mitigation targets, more of the emissions reduction takes place by reducing production.

Using subsidies to offset most of the cost of adopting mitigation technologies reduces the leakage rate considerably. The rate of leakage is reduced by about 10 percentage points in SUB80V_20 and SUB80O_20, and 15 percentage points in SUB80V_TD and SUB80V_15. This is because EU farmers mitigate more emissions via the use of technologies than by reducing production.

Indeed, subsidising the adoption of mitigation technologies alone could even lead to a negative leakage rate (scenario SUB80V_noT, shown as SUB80_noT in the figure) because some assumed mitigation technologies (e.g. breeding programmes) have a positive effect on production efficiency, leading to production increases and the replacement of non-EU production with a higher emissions intensity by EU production exported.

The ECAMPA 2 study also reviews how the leakage rate is affected by assumptions regarding the rate of improvement of emissions intensities in non-EU countries. The assumption behind the leakage rates reported above is that emissions intensities in non-EU countries will continue to improve at their trend rate. If there were no further improvement in emissions intensities in non-EU countries, then not surprisingly the leakage rate would increase by between 9 and 15 percentage points depending on the ambition level of the mitigation target. However, the converse could also happen where other world regions also adopt mitigation technologies – for example, through the technology spillover mechanism identified in the Introduction aided by climate finance from developed countries - in which case the estimates of emissions leakage reported previously should be considered an upper bound.

Himics et al., 2018

Himics et al. (2018) use the same EcAMPA 2 CAPRI model version including the same portfolio of mitigation technologies to examine the combined impact of liberalising agricultural trade through the series of free trade agreements that the EU has been negotiating as well as introducing a carbon tax of 50 €/t CO_2e on agricultural non-CO_2 emissions. The introduction of a carbon tax of this magnitude would reduce EU agricultural non-CO_2 emissions by −9.5%, while a combination of the two policies further decreases agricultural emissions by an additional percentage point to −10.7%.

Emission leakage in the EU carbon tax scenario would offset 21% of the EU mitigation effort In the FTAs alone scenario, the increase of emissions in the rest of the world more than offsets the reduction in the EU, leading to a situation where the FTA scenario results in a net increase in total global emissions. In the Combined scenario emission leakage offsets 50%

61 Note that the shift in emissions from the EU to exporting countries in the FTA scenario is not properly to be considered as carbon leakage but as carbon reallocation, given that it does not arise as the result of differences in climate policy between the trade partners.

of the reduction in EU emissions due to the carbon tax. The lower emission leakage in the EU carbon tax[61] scenario is mainly attributable to the higher share of mitigation technologies (42%) in EU emission mitigation. The FTA scenario results in a drop of EU producer prices, leading to additional EU production decreases which are substituted by more competitive imports from third countries. As this is a direct substitution of output in the EU by output in exporting countries, and as these countries have higher emission factors (i.e. higher emissions per kg produced), the net effect in EU emission mitigation is further diminished by emission leakage. The authors conclude that, from a global GHG mitigation perspective, it is important that trade agreements address emission leakage, for instance. by being conditional on participating nations adopting measures directed towards GHG mitigation.

Barreiro-Hurle et al., 2021

A further relevant study is Barreiro-Hurle et al. (2021) although this study is not focused on climate policy as such. Instead, it seeks to model the economic and environmental impacts of achieving several of the quantitative targets set out in the Farm to Fork Strategy. The analysis includes a reduction of the risk and use of pesticides, a reduction of nutrient surplus, an increase of area under organic farming, and an increase of area for high-diversity landscape features. The ex ante simulation study uses the same CAPRI model as used in the EcAMPA studies but with updated information on mitigation technologies and improved representation of land use change impacts.

Achieving the four targets can help to deliver a 20.1% reduction in emissions in the agricultural sector by 2030 including both non-CO_2 and CO_2 emissions compared to the baseline. The CO_2 removals arise from the carbon sequestered as a result of adopting some of the agricultural mitigation technologies. If the reduction in non-CO_2 gases only is considered, the reduction in emissions is 14.8%. The relative contribution of the different targets to the reduction in GHG emission is led by the nutrients and pesticide targets. However, the model results show that 66% of this is offset by increased emissions in the rest of the world. This is because only 38% of the total mitigation is achieved by reductions in emission factors driven by technology and farm practices. This compares to 64% of the total mitigation being achieved through the adoption of mitigation technologies in the equivalent HET15 scenario in the EcAMPA 2 study where the emission leakage rate was calculated at just 23%. The reason why there is a lower adoption of mitigation technologies is because farmers are obliged to meet a range of other targets in this most recent simulation whereas in the EcAMPA study they have a free hand to choose the most efficient options that just reduce emissions.

Nordin et al., 2019

More extreme results for carbon leakage arising from imposition of a carbon tax on agricultural non-CO_2 emissions are reported in Nordin et al. (2019). The purpose of their study was to assess the potential for a CBAM to limit the leakage of emissions and preserve the competitiveness of the EU agricultural sector. Here we report the leakage results just for their reference scenario where no border adjustment is implemented.

Their simulations are based on imposing a carbon tax of €120/$C0_2$e at the farm gate and comparing emissions with and without a CBAM for a reference year 2030. Because of different emissions intensities of production between EU Member States, this implies Member States have different tax rates for similar products. Their results show that implementing a levy of this size leads to a decrease of EU agricultural non-CO_2 emissions by 7.6%, i.e. 33.7 million tonnes (Mt). However, there is large leakage of emissions to the rest of the world which leads to a net increase of agricultural emissions in the world by 3.6 Mt (equivalent to 0.8% increase in EU emissions). Accordingly, their calculated emission leakage effect is 111%.

The authors use the same CAPRI model as used in the EcAMPA studies. The reason for their much higher leakage rate is because they do not allow for the adoption of mitigation technologies by EU farmers in response to the emissions levy. Emissions are linked to the level of output only. The focus of their study was on the difference that a CBAM would make to the leakage rate, rather than to accurately identify the leakage rate itself.

Jansson et al., 2021

This study uses the CAPRI model to examine the impact on global GHG emissions of removing voluntary coupled support (VCS) in the EU. It specifically asks whether more agricultural production in the EU reduces production abroad and thereby reduces global GHG emissions. Most VCS support in the EU goes to ruminant livestock sectors, though support for protein crops is also important. The model covers the main direct emissions of methane and nitrous oxide from agriculture but CO_2 emissions from land use and land use change are not included. For EU countries, emissions are calculated

endogenously (meaning, for example, that changes in feed use by animals due to a policy change can be captured and result in changes in emissions). For non-EU countries, emissions are calculated using fixed emissions intensities per unit of product produced. The study is interesting because it focuses entirely on production changes as a result of a policy change thus ignoring the potential contribution of technical and management changes that might follow from the introduction of climate policy specifically.

The study found that removing VCS support in the EU would reduce EU emissions, but that 74% of this reduction would be offset by increased emissions in non-EU countries in its standard run, with some variation in this percentage when parameter values were varied in robustness tests. Still, the global emissions change was negative regardless of how the other parameters are set within the ranges analysed. The study was able to attribute leakage effects to individual commodities, showing that different products have different sensitivities to emissions leakage. For beef, much of the reduction in the EU (77%) was cancelled out by increased emissions outside the EU. For sheep and goat meat, there was even an increase in emissions globally, despite the reduction in the EU in the policy scenario. In contrast, the reduction in emissions from milk production in the EU was accompanied by an additional small emissions reduction outside of the EU, caused mostly by a reallocation of production among world regions. For crops, increased exports from the EU replaced production abroad, leading to reduced emissions there and a small net reduction associated with crops globally.

Henderson and Verma, 2021

Henderson and Verma (2021) use a global general equilibrium model MAGNET to assess carbon leakage in a variety of different scenarios, differing in the level of the carbon tax, the number of countries implementing the tax, and the availability of abatement technologies. The study includes scenarios where only Northern European countries implement a carbon tax and these are the scenarios reported here.[62] The scenarios vary according to the carbon tax rate and whether farmers have access to abatement technologies or not. Their simulation has a 2050 time horizon during which the carbon tax is gradually increased, from USD 40/t CO_2e in 2020-2030, to USD 60/t CO_2e in 2030-2040, and to USD 100/t CO_2e for the final 2040-2050 period. In a second scenario, these carbon tax rates are simply doubled. For the carbon tax scenario with a carbon price of USD 100/t CO_2e, results are also shown for scenarios where farmers are assumed either to have access to abatement technologies or not.

The results demonstrate that the adoption of abatement technology is a more significant factor affecting carbon leakage than the level of the carbon price. In the absence of abatement technologies, the leakage rate for a carbon price of USD 100/t CO_2e would be as high as 108% if the only region implementing the carbon tax was northern Europe. However, with access to abatement technologies this leakage rate falls to 59%. If the carbon tax were doubled to USD 200/t CO_2e, the leakage rate would increase by only several percentage points. Access to abatement technologies is the main determinant of the leakage rate. The study also shows that if the group of implementing countries were widened to, say, all OECD countries, the leakage rate would further fall to 31% for a carbon tax of USD 100/t CO_2e, or 44% for a carbon tax of USD 200/t CO_2e. The study comments that these leakage rates may be overestimated to the extent that the simulations do not take account of the potential of technological change and the adoption of new technologies which would be likely to lower the cost of mitigation over time.

Frank et al, 2021

The paper by Frank et al. (2021) explores how more ambitious climate action in the rest of the world can help to reduce leakage from climate action within the EU. It compares results from three economic agricultural sector models (CAPRI, GLOBIOM and MAGNET). It assumes a carbon price trajectory on non-CO_2 emissions in the EU starting at 10 USD/t CO_2e in 2030 and increasing to 85 USD/t CO_2e in 2040 and 245 USD/t CO e in 2050. It quantifies several levels of agricultural mitigation action taken outside the EU ranging from 0% effort taken in the ROW up to 100% effort.

With unilateral EU climate action (i.e., no mitigation actions in the rest of the world), the average mitigation potential across models in the EU in 2050 is 36% (varying from 32% in GLOBIOM, 37% in MAGNET and 39% in CAPRI). The highest abatement potential is realised in the livestock sector (90% of total GHG abatement with 75% from ruminant beef and milk production), while crops are estimated to have more limited mitigation potential. However, emissions leakage decreases EU emissions savings across

62 The countries making up the northern Europe region are not defined in the OECD paper but will likely include Ireland and the UK, the Scandinavian countries Denmark, Norway and Sweden, and the Baltic countries Estonia, Latvia and Lithuania. The region accounts for 1.3% of global agricultural output.

models by an average of 40% (the leakage rate in GLOBIOM is 27%, in CAPRI 39% and in MAGNET 56%). These different leakage rates across the models are mainly explained by differences in the baseline trends. MAGNET assumes that the EU will be a much larger beef exporter in 2050 than in the other two models. This allows for higher substitution of EU beef exports and reallocation of domestic production to other world regions under a unilateral EU mitigation policy resulting in higher emission leakage. If it is assumed that the rest of the world also starts to implement mitigation efforts, these leakage rates are reduced because EU production decreases less following the introduction of a carbon tax. The less pronounced EU production decreases with increasing ROW mitigation efforts are reflected in lower EU non-CO_2 emission savings but stronger global emissions reductions.

Clora et al, 2021

The main focus of the paper by Clora et al. (2021) is to simulate the impact of alternative supply-side mitigation strategies in European agriculture (either intensification or extensification) on GHG emissions in the context of an assumed shift to a more healthy and sustainable diet by 2050 while also reducing food waste (Europe is defined as the EU + UK + Switzerland). The paper also examines how these mitigation potentials would be affected by a more ambitious trade liberalisation policy focused on concluding free trade agreements with selected countries. The scenarios are modelled using the computable general equilibrium GTAP model relative to a 2050 baseline that includes the changes in dietary preferences and food waste reduction. These demand changes are estimated to contribute to a reduction in agricultural emissions by 22% over the 2014-2050 projection period.

In their simulations, GHG emissions from European agriculture increase under the intensification scenario (by around 2.4% relative to the baseline) but would fall by 11.3% in the extensification scenario due to lower EU production. This emissions reduction would be partly offset by increased emissions in third countries, and the study calculates an overall carbon leakage rate of 48%. In the trade liberalisation scenario this leakage rate increases to 52%, whereas introducing an import CBAM would reduce this latter figure to 49%. The paper points out that, because carbon stock changes associated with land use changes are not modelled, these leakage rates may be an underestimate if increased production in third countries leads to deforestation.

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