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Emissions targets of New Zealand's agricultural export competitors – a literature review

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Client Report prepared for He Pou a Rangi Climate Change
Commission

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Report prepared for He Pou a Rangi New Zealand Climate Change Commission

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Chapter 1

Introduction

This literature review forms the initial assessment of a trade modelling exercise to examine changes in New Zealand and global livestock emissions, given the implementation of carbon pricing in New Zealand. The modelling will also examine the effects of international action on agricultural emissions reductions from New Zealand's main export competitors. New Zealand's ten most significant export competitors for agricultural goods, which are examined in this report, were: Australia, Belgium, China, France, Germany, Ireland, Italy, the Netherlands, the United Kingdom, and the United States. This selection of countries is explained further in Table 1-1.

New Zealand is currently a successful exporter of a number of agricultural products. However, this success is sensitive to changing agricultural policies overseas, the trade intensity of other exporters, as well as the shifting domestic policy environment. In recent years, there has been a proliferation of policies to address climate change mitigation and adaptation at a domestic, international and multilateral level, based on a shared understanding of the importance of addressing global climate change, with more than 100 countries pledged to reduce agricultural greenhouse gas (GHG) emissions in the 2015 Paris Agreement of the United Nations Framework Convention on Climate Change (Wollenberg, 2016). These policies which concern agricultural production and land-use will have implications for the means by which agricultural goods are produced and traded, and the potential for expansion of agricultural production in different regions.

New Zealand's current trade is highly focused on the export of primary products, largely from agriculture. These include products such as meat (beef and sheepmeat), dairy (milk powder, butter), horticulture (apples, kiwifruit) and wine. Dairy products are New Zealand's largest primary product export, valued at approximately NZ\$18.6 billion in 2021, equating to approximately 29.6 per cent of total merchandise exports by value. This was followed by meat and meat product exports, which were valued at approximately NZ\$9.3 billion, or approximately 14.8 per cent of total merchandise exports by value, in 2021 (StatsNZ, 2022).

Exports of frozen beef products in 2021 were valued at approximately NZ\$3.5 billion, or approximately 0.8 per cent of total merchandise exports by value. New Zealand's top export markets for frozen beef in 2021 included China (approximately NZ\$1.47 billion) and the US (approximately NZ\$1.2 billion). Exports of fresh or chilled beef products in 2021 were valued at approximately NZ\$531.8 million, with top importing countries including the US (approximately NZ\$124.1 million) and China (approximately NZ\$105.1 million) (StatsNZ, 2022).

In 2021 exports of butter products were valued at approximately NZ\$2.9 billion, or approximately 4.6 per cent of total merchandise exports by value. New Zealand's top export markets for butter

in 2021 included China (approximately NZ\$749 million), followed by Australia (approximately NZ\$200.3 million) and Philippines (approximately NZ\$174.3 million) (StatsNZ, 2022).

For the same year, kiwifruit exports were valued at approximately NZ\$2.8 billion, equating to 4.5 per cent of total merchandise exports by value. Top importing countries for New Zealand's kiwifruit included the European Union (approximately NZ\$777.5 million), followed by China (approximately NZ\$657 million) and Japan (approximately NZ\$582.2 million) (StatsNZ, 2022).

Finally, exports of New Zealand wine products were valued at approximately NZ\$1.9 billion (approximately 3.1 per cent of total merchandise exports by value) in 2021, with top import countries including the US (approximately NZ\$692.2 million), followed by the United Kingdom (approximately NZ\$425.9 million) and Australia (approximately NZ\$360.8 million) (StatsNZ, 2022).

It has also been recognised that agricultural production systems contribute to global GHG emissions. As such, government and industry policies that address GHG emissions from agriculture, both in general and those that target specific sectors, have provided time-sensitive targets for reductions in GHG emissions. Examples of this include the Australian red meat sector's aim to be carbon neutral by the year 2030, alongside the whole agriculture sector by 2050, as well as the European Union countries' commitment to reduce emissions by 2030. However, achievement of many of these goals must be considered with caution as they are not legally binding.

As mentioned earlier, changes in agricultural policy in New Zealand's competing export markets may have implications for New Zealand's exports. Competitor countries for New Zealand's highest exported agricultural commodities and products are shown in Table 1-1¹.

¹ Some countries may rank high in the FAO export due to re-exports of goods. Some exporting countries may also not directly compete with New Zealand exports due to finer differentiation of goods (i.e. varieties of wine), seasonality (apples in the northern hemisphere), or licensing of varieties (kiwifruit in Italy).

Table 1-1: NZ export competitors: rank by total value of exports 2015-2020

NZ Export Rank	Commodity	Rank - Other International Exporters by Value				
		1	2	3	4	5
1	Milk, whole dried	China	Netherlands	UAE	Uruguay	Argentina
2	Meat, sheep	Australia	UK	Ireland	Netherlands	Spain
3	Butter, cow milk	Ireland	Netherlands	Germany	Belgium	France
4	Meat, cattle, boneless	Australia	Brazil	USA	Netherlands	Ireland
5	Kiwifruit	Italy	Belgium	Chile	Greece	Netherlands
6	Wine	France	Italy	Spain	Australia	Chile
7	Cheese, whole cow	Germany	Netherlands	France	Italy	Denmark
8	Milk, skimmed dried	USA	Germany	France	Belgium	Australia
9	Food prep n.e.s. ⁽¹⁾	USA	China	Germany	Netherlands	Italy
10	Infant food	Netherlands	Ireland	France	Germany	Australia
11	Apples	China	USA	Italy	Chile	France
12	Milk, products n.e.s. ⁽¹⁾	Netherlands	USA	France	Denmark	Germany
13	Crude materials	Netherlands	China	Germany	USA	Colombia
14	Cream, fresh	Germany	Belgium	Netherlands	France	Spain
15	Honey, natural	China	Argentina	Germany	Ukraine	Spain
16	Wool, degreased	Australia	UK	Uruguay	China	Turkey
17	Food preparations	Singapore	Ireland	Germany	Denmark	Netherlands
18	Meat, cattle	USA	Poland	France	Netherlands	Germany
19	Milk, whole fresh cow	Germany	France	Belgium	Czechia	UK
20	Wool, greasy	Australia	South Africa	Argentina	Germany	Uruguay

(1) n.e.s. stands for not elsewhere specified or included.

(2) Colour coding indicates the top 10 export competitors selected for further analysis

Source: FAOSTAT (2022)

The following report presents a brief literature review assessing the policies and regulations of countries that are New Zealand's competitors in agricultural trade. It provides an outline of these policies and regulations, especially those that are likely to impact on agricultural production in New Zealand's international competitive markets. In addition, a review of carbon leakage is provided in Chapter 3. The report finished with a conclusion in Chapter 4.

This work will form the basis of analysis to construct scenarios of potential restrictions in production in these countries to determine the likely impacts on New Zealand's export potential.

Chapter 2

Countries

This chapter will present a literature review assessing the policies and regulations of countries that are New Zealand's main competitors in agricultural trade. The discussed export competitors are based on the intersection of common export market competitors (the 10th most commonly occurring marked in colour in Table 1-1) and the highest ranked NZ exports in value. Note that while all presented countries have set overall emissions targets in their national determined contributions, only some countries have set specific targets for agricultural emissions.

2.1 Australia

Agricultural emissions account for roughly 14 per cent of Australia's GHG emissions in 2019, although the land-based sector is a net sink for emissions due to forestry carbon capture. 45 per cent of Australia's agricultural emissions in 2019 came from Enteric Fermentation, 17 per cent from savanna fires and 17 per cent from manure left on pastures (FAO, 2022).

The Australian government aims for net zero emissions by 2050. Their 2021 national emissions reduction plan, committed to net zero emissions by 2050, inscribed low emissions technology stretch goals, affirmed the 2030 target, and reported 2021 projections results showing Australia is on track to exceed this target by up to nine percentage points (Australian Government, 2021a). In terms of agriculture, the plan modelled a 29-36 per cent decrease in agricultural emissions between 2006-2050, on the basis of low-emissions energy and the investment in low-emissions technologies. Forestry, soil carbon sequestration and other emerging technologies, such as novel methane reducing feed stocks and genetic selection, are identified as the key means for Australian agriculture to lower its emissions profile by 2050. The transition aims at maintaining Australian agricultural production: "Australia can reach net zero emissions by 2050 without imposing restrictions on our farmers or converting productive agricultural land to carbon forests" (Australian Government, 2021b).

Furthermore, Meat & Livestock Australia, Australia's red meat industry body, is aiming for Australia's red meat industry to be carbon neutral by 2030 (MLA, 2020). The industry aims to achieve this goal, through developing technologies for reducing emissions while increasing livestock productivity; increasing on farm planting and soil carbon; and improved wasted management. Specific feedstock initiatives are 25 million ha of new legume feedstocks, thought to increase livestock productivity between 25-30 per cent. Additionally, the planned use of methane inhibitors on 40 per cent of the national dairy herd and sheep flock (MLA, 2022).

2.2 USA

Agricultural GHG emissions equated to approximately 618.5 MtCO₂e in 2018, comprising 9.3 per cent of national emissions. The majority of US agricultural emissions are nitrous oxide (N₂O) emissions from agricultural soils and manure management (approximately 55 and 3 per cent of total emissions respectively) due to the high levels of nitrogen fertilisers in soil management, as well as methane (CH₄) emissions from enteric fermentation and manure management (approximately 29 and 10 per cent of total emissions respectively) (Cavigelli et al., 2012; OECD, 2020). Following the US withdrawal from the Paris Agreement initiated under President Donald Trump, the US has re-joined the Paris Agreement under President Joe Biden, committing to greater economy-wide reductions in GHG emissions (BBC, 2017; USSS, 2021). Specifically, the US has submitted a Nationally Determined Contribution (NDC) of a 50-52 per cent reduction in GHG emissions from 2005 levels by 2030, aiming to achieve economy-wide net zero emissions by 2050 (White House, 2021).

At a federal level, there is currently little specific policy direction GHG emissions reductions from US agriculture. While some policy tools incentivise the reduction of GHG emissions from agricultural production, these are not currently mandated by federal policy or law. Instead, features of federal agri-environmental programmes may assist in mitigating US agricultural emissions by proxy. For example, federal programmes that provide financial assistance for the retirement of environmentally fragile cropland may by proxy reduce US agricultural emissions (OECD, 2020). While there is currently little agriculture-specific policy at a federal level, there are some specific policies directing GHG emissions reduction in agriculture at a state level (OECD, 2020). Specifically, the State of California has outlined ambitious targets for GHG emissions reductions in specific agricultural sectors. For example, methane emissions reduction targets for the Californian livestock sector are set under Senate Bill No. 1383, which aims reduce methane emissions from the livestock sector by 40 per cent below 2013 levels by 2030. This regulation will be phased in at the start of 2024, with monitoring and reporting mechanisms for manure management coming into action in 2020 (OECD, 2020). This legislation is projected to significantly reduce state-wide methane emissions, including those generated by California's livestock sector (CARB, 2022). The State of California also operates two incentive schemes for methane emissions mitigation in the livestock sector under the California Climate Investments programme. These include the Dairy Digester Research and Development Program, which provides financial assistance for the installation of methane-mitigating technology on-farm, and the Alternative Manure Management Program, which provides financial assistance for the implementation of manure management practices designed to reduce methane emissions on-farm (CDFA, 2022a; 2022b). Other states, including Nevada, Pennsylvania and Washington, have legislated the mandatory reporting of emissions from agriculture, but have not yet established agriculture-specific GHG emissions mitigation targets (NCSL, 2021).

2.3 Brazil

In 2015, Brazil generated approximately 429 MtCO₂e in GHG emissions from agriculture, comprising approximately 24 per cent of total national emissions (if including land-use, land-use change and forestry (LULUCF)). The main sources of emissions from Brazilian agriculture in 2015 included methane (CH₄) emissions from enteric fermentation (approximately 57 per cent) and nitrous oxide (N₂O) from agricultural soils (35 per cent) and manure management (4 per cent). Under the Paris Agreement, Brazil has committed to an NDC of economy-wide GHG emissions reductions of 37 per cent below 2005 levels by 2025, and 43 per cent below 2005 levels by 2030 (OECD, 2020).

Brazil has agriculture-specific GHG emissions mitigation policy at a national level in the form of the Low Carbon Emission Agriculture (ABC) Plan. Between 2010 and 2020, the ABC Plan intended to achieve the rehabilitation of 15 million hectares of degraded pastures, increase zero tillage area from 25 to 33 million hectares, and cut agricultural GHG emissions by between 133.9 and 162.9 MtCO₂e (OECD, 2020). This has been superseded by the Plan for Adaptation and Low Carbon Emission in Agriculture (ABC+) – however, the extent to which the ABC+ Plan intends to target and reduce agricultural GHG emissions is unclear from official sources (MAPA, 2021). Other sources examining GHG reduction targets within the ABC+ Plan suggest that Brazil intends to reduce economy-wide GHG emissions by approximately 1.1 billion tonnes until 2030, which equates to seven times more than the previous plan (Agencia Brasil, 2021; Omori, 2021). To achieve this, the Brazilian government intends to install sustainable production technology across approximately 73 million hectares (equivalent to twice the land area of the United Kingdom) over the following nine years, increase the volume of treated animal waste by 208 million cubic metres, and employ intensive grazing termination methods for cattle fattening (Agencia Brasil, 2021; Apex Brasil, N.D.). As with the previous plan, this will be achieved through the provision of financial incentives to farmers looking to improve practices by adopting new technologies to recover degraded pastures, afforest land, improve animal waste treatment, and other sustainable practices. A breakdown of the GHG mitigation goals of the ABC+ Plan are presented in Table 2-1 below.

Table 2-1: Agricultural GHG Emissions Mitigation Goals of the ABC+ Plan

Activities	Scale	CO ₂ Reduction (tCO ₂ e) by 2030
Recovery of degraded pasture land	30 million hectares	113.7 million
Construction of integrated crop-livestock-forestry systems	10.01 million hectares	72.01 million
No-tillage farming	12.58 million hectares	12.99 million
Use of biological nitrogen fixation	13 million hectares	23.4 million
Planted forests	4 million hectares	510 million
Treatment of animal waste	208.4 million m ³	277.8 million
Improvement of breeding methods	5 million head	16.24 million
Development of irrigation systems	3 million hectares	50 million
TOTAL		1,076.14 million

Source: Adapted from Omori, 2021.

Brazil has also initiated a process for developing a carbon credit market for agricultural production. The voluntary Green Rural Product Certificate for environmental assets (CPR Verde), launched in October 2021, aims to reward farmers who engage in environmental conservation practices through the advance provision of capital. This is facilitated through Brazil's established capital scheme CPR, allowing farmers to raise capital against crops expected to be harvested in the same year and repay this with cash or produce at the end of its term. GHG emissions reduction is included as one of seven possible conservation projects that farmers may apply for under this scheme. It is expected that carbon credits will be provided by domestic and international investors, such as companies seeking to purchase carbon offsets (Omori, 2021).

2.4 Chile

Chile produced economy-wide GHG emissions of 111.7 MtCO₂e in 2016, with agriculture accounting for 11.8 MtCO₂e, approximately 10.6 per cent of total national emissions. Of these, 39.7 per cent are the result of enteric fermentation (CH₄), following by N₂O from agricultural soils (38 per cent), CH₄ and N₂O from manure management (17.1 per cent), CO₂ from Urea application (3 per cent), CH₄ from rice cultivation (1.1 per cent), CO₂ from liming (0.7 per cent), and CH₄ and N₂O from field burning (0.3 per cent) (MMA, 2018). Chile's updated 2020 NDC under the Paris Agreement has committed the country to economy-wide GHG emissions budget of no more than 1,100 MtCO₂e between 2020 and 2030 with a goal of annual emissions in 2030 being below 95 MtCO₂e, the establishment of an emissions maximum by 2025, and achieving carbon neutrality by 2050 (GdC, 2020). Chile also enacts climate change and GHG mitigation policy via tools such as its *Plan of Action for Climate Change 2017-2022*, which include mitigation options across 16 specific objectives (UNDP, 2022).

The extent of Chile's national agriculture-specific GHG mitigation policy is unclear. Chile was the first country in the world to register a Nationally Appropriate Mitigation Actions (NAMA) Registry with the UNFCCC in October 2012 - however, project developer interest in and uptake of NAMAs has been limited. Agriculture is included as one of six sectoral NAMAs within Chile's NAMA Registry. This NAMA is referred to as *Carbon sequestration through sustainable land management*, and seeks to mitigate between approximately 65 and 80 MtCO₂e over an unspecified period. However, to the best of the authors' knowledge, this is still under development and seeking support for implementation, with timeframes yet to be defined (MMA, 2018). Chile currently has an additional NAMA seeking support for preparation within UNFCCC's Registry entitled *Removal of atmospheric carbon through recuperation of degraded Chilean agricultural soils*, seeking approximately US\$450,000 for preparation for implementation (UNFCCC, 2022). Chile has also enacted a series of eight sectoral adaptation plans, including Agriculture, Livestock and Forestry – however, this document does not appear to be publicly available (GCF, 2021).

2.5 European Union (EU)

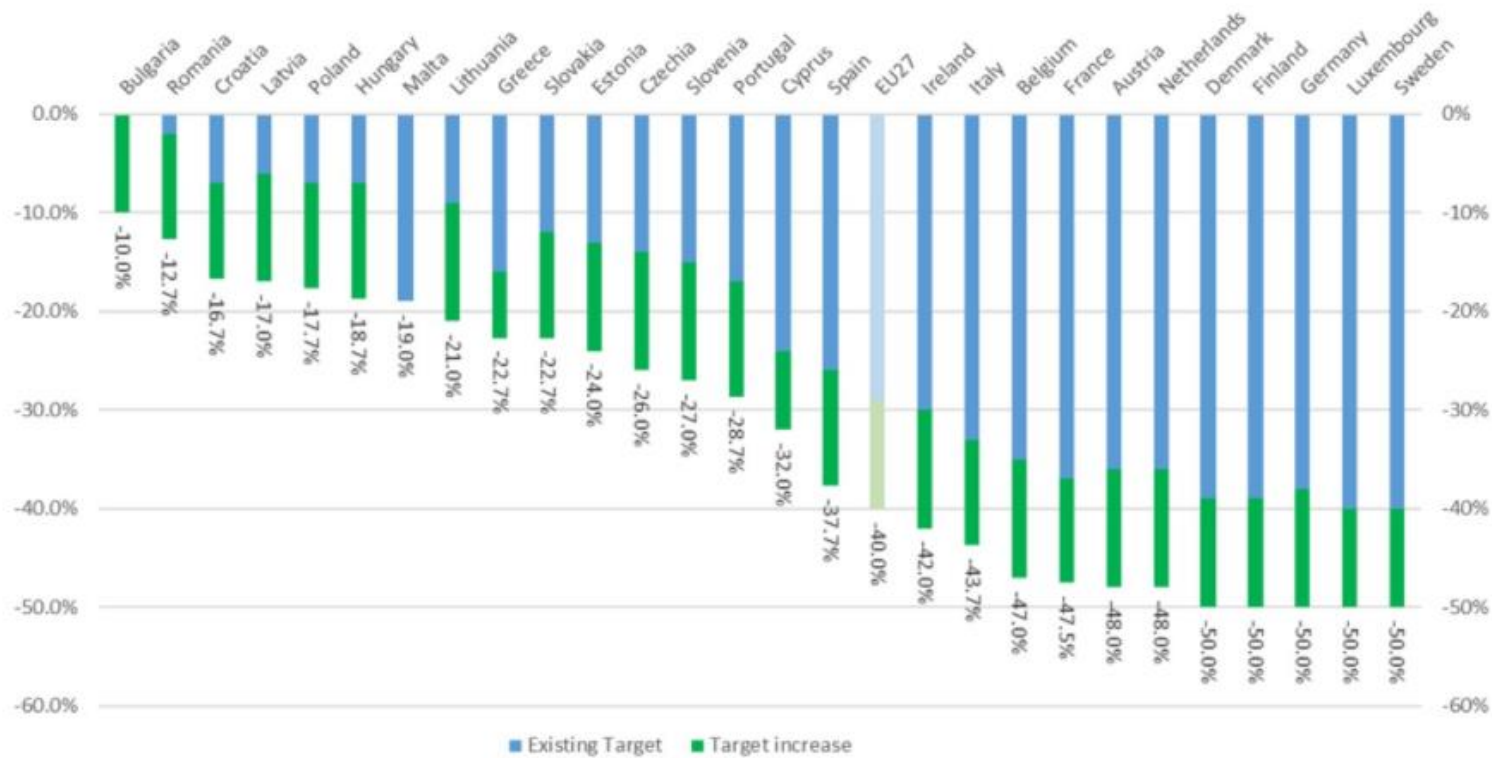
In 2019, agricultural GHG emissions in the European Union (EU) were 436 MtCO₂e which accounted for 10 per cent of total EU GHG emissions (EEA, 2021). Almost 60 per cent of agricultural GHG emissions in the EU come from France, Germany, Spain, and Poland (Mielcarek-Bochenska & Rzeznik, 2021).

By 2050, the EU aims to be climate neutral as formulated in the 2020 approved EU policy *the European Green Deal* (EPRS, 2020). In order to achieve this target, the EU has set EU-wide policy objectives and targets for the 2021 - 2030 period to decrease emissions from all sectors. This is set in their 2030 Climate and Energy framework with the binding target to cut overall emissions by 55 per cent in the EU (below 1990 levels) by 2030 (OCED, 2020). In addition, the 2030 Climate Target Plan (released in 2020 and strengthened in 2021) identifies the potential for climate neutrality in agriculture.

In order to achieve the 55 per cent decrease in emissions, sectors included in the EU's Emissions Trading Scheme (ETS) (i.e. electricity and heat generation, energy-intensive industry sectors, and commercial aviation) are obliged to reduce emissions by 43 per cent while the non-ETS sectors (i.e. transport, buildings, agriculture and waste) have to reduce emissions by 30 per cent (compared to 2005 levels) by 2030. The non-ETS sectors emission reduction targets for each member state were set in the Effort Sharing Regulation (ESR) in 2018. These national targets initially ranged from 0 per cent to 40 per cent reductions in emissions compared to 2005 levels. Within the national targets set by the legislation, member states have flexibility regarding the contribution from each non-ETS sector (EC, 2021a). In 2021, these national emission targets for non-ETS sectors were adjusted in order to meet the EU's overall emission reductions target by 2030 and to achieve climate neutrality by 2050. The European Commission (EC) proposed to reduce emissions under the ESR by at least 40 per cent (compared to 2005 levels). This is an

increase of 11 percentage points compared to the existing target of a 30 per cent emission reduction, adopted in 2018. The new proposed member states' targets range from 10 - 50 per cent (compared to 2005 levels) (EC, 2021a) as shown in Figure 2-1. For Germany, the new proposed emission reduction target for non-ETS sectors is 50 per cent, followed by the Netherlands with a new suggested emission reduction target of 48 per cent. France's and Belgium's proposed reduction target is 47 per cent each, while Italy's suggested target sits at 43.7 per cent. Spain has the lowest proposed reduction target of 37.7 per cent. The emission reduction targets for the individual countries are outlined in more detail in the following sections.

Figure 2-1: Proposed 2030 emission reduction target of each EU member state for non-ETS sectors (including agriculture).



Source: EC. 2021b.

The European Green Deal, released in 2019 and approved in 2020, is the EU's most comprehensive set of climate policy initiatives with the overall aim for Europe to be the first climate-neutral continent by 2050 (EPRS, 2020). At the heart of the Green Deal sits the Farm to Fork strategy (F2FS) which aims to establish a sustainable food system that has a neutral or positive environmental impact and to reduce the climate footprint of the food system (among other goals). The strategy sets specific agricultural emission reduction targets for 2030. These are as follows: 50 per cent cut in agricultural GHG emissions, 50 per cent cut in pesticide use and 20 per cent reduction in fertiliser use. Also, the policy demands for an increasing percentage of EU farmland under organic management from 8 per cent to 25 per cent by 2030 to achieve these targets (EC, 2019c; EPRS, 2020). The strategy includes specific actions for farming, such as working with EU member states to support better implementation of Common Agricultural Policy (CAP) objectives, enact a carbon farming initiative, and improve pesticide regulations. Actions to achieve these policy objectives must still be developed and social, environmental, and economic goals still need to be formulated. The EU has allocated 37 per cent of its recovery fund for green transition, including EUR 7.5 billion to deliver on the F2FS and improve sustainability of European farm policy. The EU approach also requests putting sustainability considerations central to the revised CAP (which will be released in 2022), and applying 40 per cent of its overall budget to climate action (EPRS, 2020).

Alongside the EU mitigation policy frameworks, a number of EU policies support agricultural GHG emissions reduction in EU Member States. The Common Agricultural Policy (CAP) has made contributions to the environmental sustainability of the agricultural sector in the EU in recent years through its aim to tackle climate change and improve sustainable natural resource management (OECD, 2020). For the period 2023-2027, the new CAP will be built around ten key objectives focussing on social, environmental and economic goals. One key objective is to contribute to climate change mitigation and adaptation, including reducing GHG emissions and enhancing sequestration (EC, 2019a; EC, 2019b).

In 2018, the EU issued a regulation on the Governance of the Energy Union and Climate Action that required all its member states to submit and adopt a 10-year National Energy and Climate Plan (NECP) to map out how each member state will contribute to the EU's binding climate and energy targets for 2030 (EPRS, 2020).

The next sections will outline mitigation policies and their emission reduction targets and (if available) specifically agricultural emissions reductions targets of selected EU member states. These countries were selected as they are direct competitors for agricultural commodities for New Zealand exports.

2.5.1 Germany

In 2019, Germany was responsible for a total of 808 MtCO₂e, and the country accounts for 22 per cent of emissions of the EU total. Germany's agricultural emissions represented 7 per cent of the country's total emissions in the same year (EPRS, 2021a).

Germany aims to be climate neutral by 2045 (EU has a mandatory climate neutral target by 2050) and it wants to reduce GHG emissions from all sectors by 65 per cent (compared to 1990 levels) by 2030. These targets are determined in the German Federal Climate Change Act (Bundes-Klimaschutzgesetz, KSG) which aims to provide protection from the impacts of global climate change by ensuring the achievement of the national climate targets and compliance with EU targets. With regards to agricultural emissions, the Act outlines to reduce annual emissions in the agricultural sector by 14 MtCO_{2e} to a total of 56 MtCO_{2e} by 2030 (Federal Ministry of Justice, 2021).

The 2030 Climate Action Programme includes measures such as the reduction of nitrogen surpluses, strengthening of the fermentation of manure, expansion of organic farming and the reduction of GHG emissions in livestock farming as well as the promotion of carbon storage potentials in agricultural lands (Appunn, 16 Aug 2021).

Germany has committed EUR3.3 billion of its recovery budget to help agriculture and livestock farmers transition toward more climate-friendly farming models (Farmers for Climate Solutions, 2021).

Furthermore, as with all EU Member States, policies for mitigating agricultural emissions in Germany can be linked to the goals of EU-wide mitigation policies including the 2020 Energy and Climate Package, the 2030 Energy and Climate Framework and the related Effort Sharing Regulation, which covers emissions from sectors not included in the current ETS, such as transport, buildings, agriculture and waste. Under this legislation, Germany's current 2030 target is to reduce emissions from non-ETS sectors by 38 per cent from 2005 levels. According to the EC's assessment of Germany's National Energy and Climate Plan (NECP), the reduction will fall short of the target by 3 percentage points (EPRS, 2021a).

In addition, in 2020, the German government founded the Commission for the Future of Agriculture which will develop a comprehensive common understanding of how improved animal welfare, biodiversity and climate and environmental protection can be reconciled with the safeguarding of harvests and the economic viability of domestic farms (Appunn, 16 Aug 2021).

2.5.2 France

In 2019, France generated 459 MtCO_{2e} in total emissions representing 12 per cent of the EU total emissions. In the same year, French agriculture generated 74.8 MtCO_{2e} of GHG emissions, accounting for 16 per cent of national emissions (EPRS, 2021b).

As EU member state France falls under EU climate legislation. Hence, the EU 2020 Energy and Climate Package and the 2030 Energy and Climate Framework provide the underlying framework for GHG mitigation policies in France. Under the EU Effort Sharing Legislation, France is obliged

to reduce GHG emissions from non-ETS sectors (including agriculture) by 37 per cent by 2030 (compared to 2005 levels) (EPRS, 2021b).

The foundation of France's climate policy is the Energy Transition and Green Growth Act (ETGGA) (2015). This framework sets the target of reducing national GHG emissions by 40 per cent between 1990 and 2030 (in line with EU objectives and the Paris Agreement) and by 75 per cent between 1990 and 2050 (OECD, 2020).

Similar to Germany, France has also set agricultural emission reduction targets. These are set in the country's National Low-Carbon Strategy (NLCS) which was submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2017. France initially set a target to reduce agricultural emissions by 12 per cent (compared to 2013 levels) by the end of its third carbon budget period in 2028 and by 24 per cent (compared to 1990 levels) by 2050. The NLCS was revised in 2018 to take into account the new EU objective of carbon neutrality by 2050. In addition, it set the fourth carbon budget for the period 2029-33 and adjusted previous carbon budgets downward to allow France to meet its EU and international mitigation commitments. The current reduction comprises of an 8 per cent cut of agricultural GHG emissions by 2023, 13 per cent by 2028 and 20 per cent by 2033 (compared to 2015 levels) (OECD, 2020).

France also has a target of 50 per cent of farms committing to agro-ecology by 2025. This strategy includes numerous measures to improve on-farm nitrogen use efficiency, including increasing the use of nitrogen fixing legumes and selecting crop varieties that require less inputs. Measures for livestock are also included for feed, manure storage, and enteric fermentation (Farmers for Climate Solutions, 2021).

Furthermore, France plans to develop renewable energies of agricultural origin and bioenergy from forest residues, and improvement of the energy performance of agricultural holdings. Additional measures include high-precision agriculture and acting on the carbon destocking of agricultural soils to reverse the trend (EPRS, 2021b).

2.5.3 Netherlands

In 2019, the Netherlands generated a total of 200 MtCO₂e net emissions, representing 5 per cent of EU total emissions (EPRS, 2021c). In the same year, Netherlands agricultural emissions accounted for 10 per cent of its total emissions, with the sector generating 18.2 MtCO₂e of GHG emissions.

Policies for mitigating agricultural emissions in the Netherlands are linked to the targets set under the EU 2020 Energy and Climate Package, the 2030 Energy and Climate Framework and the Effort Sharing legislation. Under this framework, the Netherlands are committed to reducing GHG emissions from non-ETS sectors (including agriculture) by 36 per cent by 2030, compared to 2005 levels (OECD, 2020).

The Clean and Efficient Agro Sectors Covenant and the recent Climate Agreement translate the targets communicated under the 2020 Energy and Climate Package and the 2030 Energy and

Climate Framework into sector-specific targets, including agriculture. Mitigation efforts for agriculture in the Netherlands focus on the livestock and the greenhouse horticulture industries which combined represent 90 per cent of agricultural GHG emissions (OECD, 2020).

The Netherlands aim to reduce agricultural GHG emissions by 3.5 MtCO₂e by 2030 through initiatives in livestock farming, improved soil management, reduced deforestation, and intensifying the Greenhouse as a Source of Energy program. EUR252 million will be provided to fund measures including precision dairy farming, study of nitrification inhibitors and fertiliser replacement (Framers for Climate Solutions, 2021).

In the Netherlands, some agricultural industry initiatives exist that set GHG reduction targets. For example, the Sustainable Dairy Chain is an initiative from the dairy industry (Dutch Dairy Association) and dairy farmers (Dutch Federation of Agriculture and Horticulture). They have set GHG emission reduction targets for the dairy industry and formulated specific goals to make the dairy sector more sustainable. This included decreasing dairy emissions by 20 per cent by 2020 (from 1990 levels) and achieving climate neutral growth compared to 2011 (OECD, 2020). Wageningen University reports that these targets were mostly met (Wageningen University & Research, 2020).

The Sustainable Dairy Chain initiative encourages a number of good agricultural practices to achieve these emissions reductions, including measures for soil conservation, grazing preservation, less use of artificial fertiliser, improved feed efficiency, growing and feeding corn, and the use of clover as a nitrogen source. Some Dutch dairy companies, such as Royal Friesland Campina and Vreugdenhil Dairy Foods, have expressed their interest in achieving climate neutrality. In 2018, 85 per cent of Vreugdenhil dairy farmers received a sustainability incentive premium (OECD, 2020).

2.5.4 Spain

In 2019, Spain accounted for total GHG emissions of 333 MtCO₂e, representing 9 per cent of total EU emissions. Spanish agriculture accounted for 12 per cent of national emissions in the same year (EPRS, 2021d).

In May 2021, Spain adopted the country's first Climate Change and Energy Transition Law committing to an overall emissions reduction target of 23 per cent by 2030 (compared with 1990 levels). This is in line with the commitments of the EC and the European Green Deal legislation.

Policies for mitigating agricultural emissions in Spain are linked to the targets set under the EU's 2020 Energy and Climate Package, the 2030 Energy and Climate Framework and the Effort Sharing legislation. Under this framework Spain has a reduction target of 26 per cent (compared with 2005 level) for non-ETS sectors for the 2021-2030 period (EC, 2021c). However, Spain plans to exceed this target and reduce emissions by 39 per cent, to reach its 2030 target of reducing total emissions by 23 per cent (below 1990 levels). In their assessment, the EC concluded that Spain's National Energy and Climate Plan sets a comprehensive set of measures to meet this

ambitious target. Agricultural emissions represent a large share of non-ETS sector emissions (second after transport) and proposed measures by the NECP are expected to cut this sector's emissions by 18 per cent by 2030 (compared with 2005) by reducing emissions associated with fertiliser use and manure management (EPRS, 2021d).

2.5.5 Italy

In 2019, Italy generated a total of 427 MtCO₂e which represented 11 per cent of EU's total. Italian agriculture accounted for 7 per cent of national emissions in the same year (Source: (EPRS, 2021e).

Italy's policies for reducing agricultural emissions are in line with the targets set under EU policies (i.e. the 2020 Energy and Climate Package, the 2030 Energy and Climate Framework and the Effort Sharing legislation). With regards to the Effort Sharing regulation Italy is obliged to reduce its emissions by 33 per cent (compared to 2005 levels) from non-ETS sectors including agriculture. Italy has remained consistently within its allocated emission targets and is expected to slightly exceed the 2030 target. The reductions in the agriculture will be mostly linked to energy use in the sector (EPRS, 2021e).

As mentioned in Section 2.5, EU legislation required that each member state implemented a 10-year National Energy and Climate Plan (NECP) which outlines how the country reaches its national targets, including the binding national target for reducing GHG emissions for non-ETS sectors including agriculture (OECD, 2020; Ministry of Economic Development, 2019). Therefore, Italy submitted its National Energy and Climate Plan 2021-2030 in order to fulfil the binding EU targets of reducing GHG emissions by at least 40 per cent. With regards to agriculture, in their assessment of the NECP, the EU concluded that the plan qualitatively mentions the interactions with air quality and air emissions policy, in particular in the context of domestic heating and agricultural emissions. However, it does not provide any quantitative information. Hence, Italy has not set specific agricultural emissions reduction targets to date (EC, 2020a).

2.5.6 Belgium

In 2019, Belgium generated a total of 123 MtCO₂e emissions which accounted for 3 per cent of the EU total. Agricultural emissions represented 8 per cent of Belgium's total emissions in the same year (EPRS, 2021f).

In line with all EU member states, policies for reducing agricultural emissions in Belgium are formulated in the targets set by EU policies (i.e. the EU 2020 Energy and Climate Package, the 2030 Energy and Climate Framework and the Effort Sharing legislation). For the non-ETS sectors (including agriculture), the Effort Sharing Regulation requires Belgium to reduce its emissions by 35 per cent (compared with 2005 levels) for the period 2021-2030 (EPRS, 2021f). This target is set in the final version of the National Energy and Climate Plan (NECP) (EC, 2021d). However, in their assessment, the EC concluded that the NECP does not provide quantifiable information nor projections for specific policies and measures related to agriculture (EC, 2020b).

2.5.7 Ireland

In 2019, Ireland generated a total of 62 MtCO₂e emissions of which 19.95 MtCO₂e were from the agricultural sector. The GHG emission profile of Ireland differs from that of most other EU member states, with agriculture contributing 31 per cent of the country's GHG emissions while on average, agriculture is responsible for 10 per cent of total emissions in the EU (EPRS, 2021g).

Furthermore, as EU member state Ireland falls under EU climate legislation. Hence, the EU 2020 Energy and Climate Package and the 2030 Energy and Climate Framework and the related Effort Sharing legislation provide the underlying framework for GHG mitigation policies in Ireland. Under the Effort Sharing regulation, Ireland is obliged to reduce emissions from non-ETS sectors (including agriculture) by 30 per cent (below 2005 levels)(OECD, 2020; EPRS, 2021g).

In line with EU legislation, Ireland adopted a National Energy and Climate Plan (NECP) for the period 2021-2030. Ireland submitted its NECP in mid-2019 (EPRS, 2021g). In October 2020, the EC published an assessment for each NECP. The EC projected that Ireland's 2030 target for GHG emissions reduction from non-ETS sectors of 30 per cent will be missed by at least 17.5 percentage points (EC, 2020c).

Also, Ireland's target to reduce emissions from the agricultural sector is led by the EU Climate and Energy Framework, especially the European Green Deal policy, including the Farm to Fork strategy and Biodiversity strategy. In addition, Ireland has formulated Ag Climatise - a National Climate & Air Roadmap for the agricultural sector. The roadmap sets the vision for a climate neutral agriculture sector by 2050 with 29 actions to reduce the environmental footprint. The roadmap formulates specific targets such as 40-50 per cent reduction in nitrous oxide emissions associated with fertiliser use by 2030 and 90 per cent of livestock manure should be applied by Low Emission Slurry Spreading (LESS) Technology by the end of 2027 as well as having 350,000 ha of organic production by 2030 (Department of Agriculture, Food and the Marine, 2020; Government of Ireland, 2020).

2.6 United Kingdom

In 2020, the United Kingdom (UK) was responsible for approximately 406 MtCO₂e in GHG emissions within its territories, with emissions reducing across most sectors compared with 2019 emissions. Agriculture accounted for approximately 45 MtCO₂e, or 11 per cent of total national emissions in 2020. Of these, methane (55 per cent) and nitrous oxide emissions (32 per cent) were most dominant, with methane emissions from enteric fermentation being the highest, followed by fertiliser use on agricultural soils. Agricultural emissions decreased by 3 per cent between 2019 and 2020, with overall agricultural emissions declining 16 per cent between 1990 and 2020 (DBEIS, 2022). Under the Paris Agreement, the UK's 2020 NDC has committed to achieving economy-wide GHG reductions of at least 68 per cent by 2030 compared to 1990 levels. In addition, in September 2019, UK legislation was passed that established a legally binding target of reducing GHG emissions to net zero by 2050 (UK Government, 2020). Methods to achieve this goal are outlined in the UK's Net Zero Strategy, which outlines emissions reduction

actions across a range of sectors, ultimately aiming to achieve net zero GHG emissions by 2050 (HM Government, 2021).

While the UK's legally binding commitment to be net zero by 2050 has no specific targets for agriculture, there are some strategic intentions for addressing agricultural GHG emissions within its Net Zero Strategy. Actions for reducing GHG emission from agriculture are included within the strategy's Natural Resources provisions, which also includes afforestation, peat restoration, waste emissions from landfill and other sources. Reduced agricultural emissions are stated to be achieved through improve and innovative farming practices that aim to reduce emissions associated with livestock and nutrient management. This includes the establishment of several land management incentive schemes, including the Sustainable Farming Incentive (SFI), Local Nature Recovery Scheme (LNR), and Landscape Recovery Scheme (LRS) (HM Government, 2021). The Sustainable Farming Incentive is set to be launched in June 2022, will provide financial incentives to farmers seeking to improve the environmental sustainability of their operations and increase long-term food productivity, including high standards for animal health and welfare, and environmental health. The SFI provides agriculture sector-specific incentives in 2022 for these improvements, including arable and horticulture, grassland, moorland, and other sectors (DEFRA, 2022a). While there are no specific incentives for reducing GHG emissions under the SFI, the UK Government has stated that agricultural incentive schemes "will provide a powerful vehicle for achieving net zero" (DEFRA, 2022; HM Government, 2021). In addition, the Agricultural Transition Plan 2021-2024 states that the UK Government "will pay farmers to improve the environment, improve animal health and welfare, and reduce carbon emissions" – however, there is little detail as to how this will be achieved (DEFRA, 2020). Other agricultural initiatives from 2026 under the Net Zero Strategy also include the potential introduction of "proven agricultural innovation measures, potentially including the use of feed additives for livestock" and increasing tree plantings, peatland restoration and perennial energy crops (HM Government, 2021).

The Net Zero Strategy further expands commitments to GHG reductions in UK agriculture, including the following goals (among other non-GHG-specific goals):

- 75 per cent of farmers in England engaged in low carbon practices by 2030, rising to 85 per cent by 2035;
- increased investment in industry-led research and development into solutions to help deliver net zero in agriculture and horticulture, including through the Farming Innovation Programme;
- triple woodland creation by landowners to meet UK targets of planting 30,000 hectares per year by 2025 and maintaining at least this level from 2025 onwards;
- boost the existing £640 million Nature for Climate Fund with a further £124 million to ensure over £750 million is spent on peatland restoration and woodland creation and management by 2025;

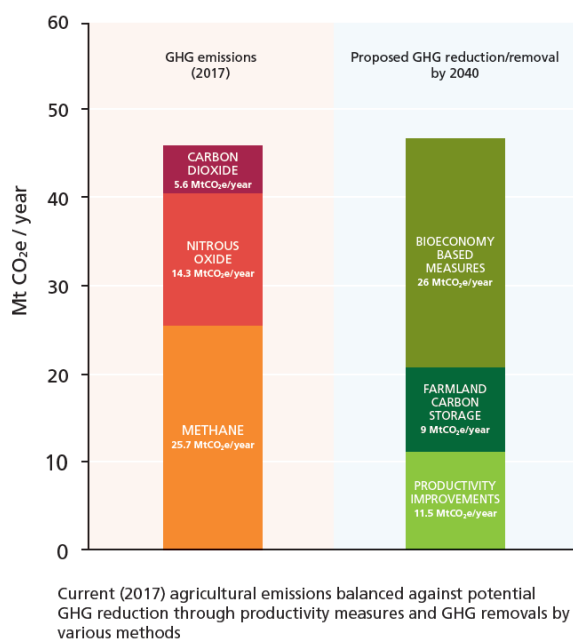
- restore at least 35,000 hectares of peatlands in England by 2025 via the Nature for Climate Fund;
- restore at least approximately 280,000 hectares of peat in England by 2050;
- mobilise private investment into tree planting via the Woodland Carbon Code and Woodland Carbon Guarantee;
- mobilise private investment into peat restoration via a package of reforms to the Peatland Code.

There is also funding available for innovation projects aimed at making UK agriculture more climate resilient and reduce agricultural emissions in the UK. The first round of the Farming Future R&D Fund, initiated in March 2022, is focused on *climate smart farming*, for which DEFRA will invest up to £12.5 million in climate-focused innovation projects (DEFRA, 2022b).

Brexit has also presented challenges to the UK in shifting from EU policies such as the Common Agricultural Policy (CAP) into developing UK-specific policies. For example, the CAP 2014-2020, to which the UK was party prior to Brexit, attributed approximately one quarter of funding (over €100 billion) to climate change mitigation and adaptation actions (ECA, 2021). As a result of Brexit, the UK will no longer be subject to the CAP, and has subsequently initiated processes for developing UK-specific policy to shift away from the CAP, such as the Agricultural Transition Policy 2021-2024 (DEFRA, 2020).

There has been some movement by UK farming industry bodies to address GHG emissions in agriculture. The National Farmers Union (NFU) has set the ambitious goal of reaching net zero greenhouse gas (GHG) emissions across the whole of agriculture in England and Wales by 2040 – ten years in advance of the UK Government’s net zero emissions target. The NFU has acknowledge that UK agriculture can assist emissions reductions as being both a source and sink of GHG emissions, and states that this goal can be achieved through bioeconomy-based measures (reducing approximately 26 MtCO₂e per year), farmland carbon storage (reducing approximately 9 MtCO₂e per year), and productivity improvements (reducing approximately 11.5 MtCO₂e per year). An outline of these measures is shown in Figure 2-2 below. The NFU have provided sector-specific actions in each of these areas that could improve emission reductions to achieve this goal. The NFU have also acknowledged that in order to achieve this goal, effective partnerships between government, industry and academia must be enacted (NFU, 2019).

Figure 2-2: National Farmers Union Net Zero 2040 GHG Mitigation Measures



Source: NFU, 2017.

2.7 China

In 2019, China was responsible for an estimated total of 10.49 billion tons CO₂e this was over 27 per cent of total global emissions. In the same year, China's agricultural sector contributed about 650 MtCO₂e. Of these agricultural emissions, 183 MtCO₂e or 50 per cent of China's agricultural methane emissions came from enteric fermentation, and 146 MtCO₂e or 40 per cent from the cultivation of rice (FAO, 2022).

In ratifying the Paris agreement on Climate Change in 2016, China's Nationally Determined Contributions (NDC) set economy wide emissions targets, but no specific industry targets have been set (OECD, 2021b). The NDCs aim to achieve peak emissions in 2030, and to lower CO₂ emissions per unit of GDP by 60-65 per cent from 2005 levels. In 2020, China committed to carbon neutrality by 2060.

In March 2021, China published its 14th Five Year Plan (2021 – 2025). This plan includes energy and carbon intensity reduction targets, as well as a mid-point non-fossil share target in order to achieve its NDC. However, the plan does not define any specific targets for agricultural emissions (KPMG China, 2021). In addition, in October 2021 China submitted its Long-term Low Greenhouse Gas Emission Development Strategy (LT-LEDS). However, the agreed carbon neutrality target is covering only CO₂ emissions, not other greenhouse gases (UNFCCC, 2021).

While no emissions targets for agriculture exist the NDC outline the plan for the low carbon development in agriculture, including: zero growth of fertiliser and pesticide use by 2020; to control methane emissions from rice fields and nitrous oxide emissions from farmland; to

construct a recyclable agriculture system, promoting comprehensive utilization of straw, reutilization of agricultural and forestry wastes and the comprehensive utilization of animal waste.

In contrast, other Chinese agricultural policy goals include an increase in production of pig, beef, and sheep meat as stated in the 2021 No. 1 Central Document. This document implies a concurrent production increase simultaneous with the NDC emissions targets (OECD, 2021b).

Furthermore, the Chinese government developed an agricultural biogas development plan in 2017 to reduce the country's GHG emissions by increasing agricultural biogas and digestate fertiliser production to reduce the use of mineral fertiliser and N₂O emissions from agricultural soils. This plan provides farm subsidies for the construction of biogas digesters or plants (OECD, 2021b).

Chapter 3

Carbon Leakage

Carbon leakage is the movement of polluting industries from one country to other parts of the world in order to avoid compliance with more ambitious domestic environmental laws and carbon pricing (MFAT, 2021). Only a limited number of studies exist that assessed the risk of carbon leakage associated with climate policies on the agricultural sector (e.g. OECD, 2021c; OECD, 2019; Key & Tallard, 2012; Van Doorslaer et al., 2015; Larch & Wanner, 2017). There is some evidence of the possibility of carbon leakage from unilateral agricultural mitigation policy implementation (e.g., Fellmann et al. 2018; Peters et al., 2001; Lee et al., 2007), however the literature shows that estimates of levels of carbon leakage vary significantly (OECD, 2021a). For example, Kerr & Zhang (2009) showed that including the agricultural sector into the NZ ETS would result in small carbon leakage. In contrast, in their study, Key & Tallard (2012) find that two-thirds of emission reductions through an implementation of a carbon tax on livestock emissions in developed countries was leaked to developing countries. In addition, OECD (2019) estimated that 34 per cent of emissions reduction from a carbon tax on agricultural production in all OECD countries was leaked; shown through an increase of agricultural emissions in non-OECD countries. For Australia –New Zealand specifically a more recent study (OCED, 2021c) showed that if they were to implement a carbon tax of USD100 tCO₂-eq-1 on non-CO₂ agricultural emissions by 2050, approximately 50 per cent of their emission reductions would be offset by carbon leakage. However, if the number of countries that apply the carbon tax would increase, carbon leakage could fall to 21 per cent (OCED, 2021c). Overall, the OCED (2021c) concludes that carbon leakage is never likely to be high enough to fully offset the reductions in emissions from carbon taxes and the degree of carbon leakage gets smaller the more countries implement carbon taxes. Also, Van Doorslaer et al. (2015) showed that agricultural producers would meet carbon emission reduction targets through reducing emission intensities and an additional decrease in agricultural production. However, this production decrease must then be offset by an increase in agricultural imports (predominately from Africa) which results in carbon leakage. Van Doorslaer et al., (2015) further shows that this leakage could be reduced by 13 per cent through the implementation of an emissions trading scheme.

Trade policy instruments exist that are aimed to prevent carbon leakage. These are (1) border carbon adjustment mechanisms (BCAM) (emissions in non-regulated imports are taxed at the border, and payments made exports to non-regulated countries are rebated); and (2) other related measures such as environmental standards for imports such as non-product related process and production methods. These methods include mandatory and voluntary environmental standards which could reduce leakage provided the same requirements were applied to domestic agricultural products and imports. However, just as with BCAMs, the World Trade Organization (WTO) compatibility for non-product related process and production

methods is uncertain and will depend on their design, transparency, predictability and feasibility (OECD, 2021a).

Modelling studies show that carbon border adjustment mechanisms are the most effective at reducing carbon leakage, but may create regional inequality (Böhringer et al., 2012) and through their trade-distorting nature may violate WTO rules. The opportunity for leakage would be significantly reduced, ideally through multi-lateral agreements (Fellmann et al., 2018) but could also be reduced through regional or bi-lateral commitments within trade agreements.

Chapter 4

Conclusion

The primary policy goals of the examined nations are economy-wide emissions targets as part of their commitments under the Paris agreement signed at COP 21. Economy-wide net zero emissions targets are in place for Australia; Chile; European Union countries; the US, and the UK by 2050, and in China by 2060.

While some of these agreements include reduction targets for different sector groupings of the economy, goals for agriculture are not specified. For example, the EU member states have emissions targets for their non-ETS sectors, which includes the agriculture sector but does not imply that any reduction must come from agriculture specifically.

Outside of the Paris agreements some countries have government targets or strategies for emissions reductions for agriculture, such as the Irish government's *Ag Climatise* policy or the UK's 'agricultural Transition Plan 2021-2024'. These strategies outline broad areas of action in terms of change of agricultural systems and investment into technologies and farmer supports, but do not highlight policy restrictions for agricultural emissions or practices.

These transition plans for agriculture are in a framework of increasing carbon storage, agricultural productivity, and low emissions manure management. This implies an intention to either maintain levels of production or even increase production. The cessation of fertiliser-use and a shift to widespread organic methods of farming are also cited in many countries' agricultural plans for emissions reductions.

Commodity-specific emissions reduction goals are uncommon in government and multi-national agreements; however, a few national-level industry bodies have stated targets for their sectors. The most significant of these are Meat & Livestock Australia aiming to reach carbon neutrality in the red meat sector by 2030; the National Farmer's Union of England and Wales aiming for carbon neutrality in agriculture by 2040; and the Netherland's dairy industry aiming for a 20 per cent reduction in dairy emissions by 2020. These targets, while ambitious, are not legally binding.

Table 4-1 provides a summary of the key emissions targets in the selected regions. While some climate policy and programmes in these markets have no explicit barrier to the expansion of agriculture, the necessity to reduce emissions in many countries makes increasing production (e.g. increased animal numbers) unlikely. Based on these assumptions, it is possible to construct a likely set of international responses which will impact upon New Zealand's exports, and the global trading environment.

Table 4-1: Summary Table

Country/ Region	Specific agricultural reduction targets available	Targets
EU ⁽¹⁾	Yes	European, Green Deal Targets by 2030: 50 per cent cut in agricultural GHG emissions, 50 per cent cut in pesticide use and 20 per cent reduction in fertiliser use.
Germany	Yes	Reduction of annual agricultural emissions by 14 MtCO ₂ e compared with 2014 to a total of 56 MtCO ₂ e by 2030; Reduction of 31-35% of agricultural emissions by 2030. All sectors: By 2030, reduction in GHG emission by 65% compared with 1990.
France	Yes	8 per cent reduction of agricultural GHG emissions by 2023, 13 per cent by 2028 and 20 per cent by 2033, compared to 2015 levels
Spain	Yes	Proposed measures are expected to cut agricultural emissions by 18% by 2030 (compared with 2005) by reducing emissions associated with fertiliser use and manure management.
Netherlands	Yes	The Netherlands aims to reduce agricultural GHG emissions by 3.5 MtCO ₂ e by 2030, through initiatives in livestock farming, improved soil management, reduced deforestation, and intensifying the Greenhouse as a Source of Energy program. All sectors: Netherlands' greenhouse gas emissions by 49% by 2030, compared to 1990 levels, and a 95% reduction by 2050. These goals are laid down in the Climate Act on May 28, 2019.
Italy	No	No specific agricultural emission targets. EU Effort sharing legislation target for the 2021-2030 period states a reduction of emissions from non ETS sectors (incl. agriculture) by 33% by 2030 (below 2005 levels).
Ireland	No	EU Effort sharing legislation target for the 2021-2030 period states a reduction of emissions from non ETS sectors (incl. agriculture) by 30% by 2030 (below 2005 levels).
Belgium	No	No specific agricultural emission targets. EU Effort sharing legislation target for the 2021-2030 period states a reduction of emissions from non ETS sectors (incl. agriculture) by 35% by 2030 (below 2005 levels).

USA	Yes	California has a target for reducing emissions from the <u>livestock sector</u> (specifically methane) by 40% below 2013 levels by 2030 (not on track to meet target though) USA all sectors target: 50-52% below 2005 levels by 2030; net zero target by 2050
Brazil	Yes	Ag reduction target of 1.1bn tonnes of CO ₂ under a new climate-oriented agriculture (ABC+) program for 2020-30. Specific targets for mitigation activities include: <ul style="list-style-type: none"> • Recovery of degraded pasture land: 113MtCO₂e; • crop-livestock-forestry systems: 72 MtCO₂e; • no-tillage farming: 12MtCO₂e; • use of biological nitrogen fixation: 23MtCO₂e; • planted forests: 510MtCO₂e; • treatment of animal waste: 278MtCO₂e • improvement of breeding methods: 16MtCO₂e; development of irrigation systems:50MtCO₂e
Chile	Yes	All sectors: target to limit total annual emissions to 95 MtCO ₂ e by 2030. Net zero target by 2050. Reduce agricultural emissions through carbon sequestration and sustainable land management: 65-80 MtCO ₂ e. No specific time period.
Australia	Yes	All sectors: Australia committed to a 26–28% reduction of GHG emissions by 2030 below 2005 levels (= range of 442-464 MtCO ₂ e emissions in 2030). Meat and Livestock Australia (MLA) aims for carbon neutral red meat sector by 2030.
United Kingdom	Yes	The National Farmers Union (NFU) has set the ambitious goal of reaching net zero greenhouse gas (GHG) emissions across the whole of agriculture in England and Wales by 2040. (UK's has a net zero goal by 2050 but has no specific target for ag emissions.)

(1) The EU 2030 Climate and Energy framework set a binding target to cut GHG emissions. There are EU wide targets for EU ETS sectors, and non-ETS sectors incl. agriculture are subject to national targets to jointly achieve to cut 40% in emissions against 2005 levels (= EU effort-sharing legislation).

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