Rialtas na hÉireann
Government of Ireland

REPORT OF THE FOOD VISION BEEF AND SHEEP GROUP TO MITIGATE GREENHOUSE GAS EMISSIONS FROM THE BEEF SECTOR

30 November 2022

Contents

Proposed Measures

Direct Impact measures to mitigate Greenhouse Gas Emissions from the beef sector				
Measure	**Estimated CO_2 equivalent reduction**	**Estimated economic cost at farm level**	**Target GHG**	**Timeframe**
1. Improving live weight performance for beef cattle resulting in earlier slaughter ages, reducing age of slaughter by between 2.7 and 3.9 months on average, from 2018 average of 26 months to 22-23 months on average by 2030.	0.57 – 0.82 Mt CO_2 eq	Estimated to have a positive economic effect at farm level with some potential loss in tonnage for the processing sector. Farm-level investment in weight recording and improvement in farm management practices are required	Methane	Short/Medium
2. Reduce age at first calving of suckler beef cows by between 2.0 to 3.8 months compared to 2018	0.05 – 0.10 Mt CO_2 eq	Estimated to have a positive economic effect at farm level	Methane	Short/Medium
3 - Development of methane-mitigating feed technologies.	0.15 – 0.3 Mt CO_2 eq	The cost per animal is €25.55 per head of cattle per year based on a price per kg of 3NOP that is assumed to be €80kg. Total estimated aggregate cost is €11.3m. If we were to include the new technology and assume that the efficacy increases to 20% with the new technology, and the uptake assumption is 25% of all non-dairy bovines then the mitigation from the beef system increases to 0.303 MtCO2 eq . The aggregate costs increase to €29m per annum.	Methane	Short/Medium
4 - Target a 90% replacement rate of CAN with Protected Urea by the end of 2025 for grass-based beef production systems	0.2 Mt CO_2 eq	No additional cost Protected Urea is cheaper than CAN on a cost per kg of Nitrogen basis and while it may appear slightly dearer than standard Urea, it provides the same “effective N” for the plant as Urea at a 12% lower spreading rate.	Nitrous Oxide	Short-term

5- Reduce chemical Nitrogen use in the beef sector by 27% - 30% on average by 2030, with interim target of 22 - 25% by 2025. *(This is a reduction from approximate usage in 2018 by the Beef and Sheep Sector of 143k tonnes to 104k - 100k tonnes by end of 2030)*	Up to 0.26 Mt CO_2 eq by the end of 2030	Teagasc analysis into Nitrogen reduction and its impact on profitability per hectare in the dairy sector is currently being updated to take account of enabling measures available to maximise Nitrogen use efficiency which mitigate against this cost. A parallel exercise is required focussing on the beef sector.	Nitrous Oxide	Short-term Medium-term
6 – Increase area under Organic beef production to 180,000 ha by 2027	0.2 Mt CO_2 eq	€37 million of public funding to support the transition to organics has been provided under the CAP Strategic Plan 2023-2027. Further research is required to establish the price premium available in the market for organic beef.	All	Medium-term
7.a) Develop methane mitigating Breeding Strategies (carbon sub-index) 7.b) Develop methane mitigating Breeding Strategies (building efficiency traits)	0.1 - 0.3 Mt CO_2 eq	Genotyping strategy initial costs is estimated by ICBF at €10.1 m per annum with cumulative cost estimates at €80.9m to 2030.	Methane	Short-term (EF) Medium-Long term (DI)
Total CO_2 equivalent reduction For measures 1 to 7 inclusive	1.53 - 2.18 MT CO_2 eq			
8 – Voluntary Diversification Scheme (removal of suckler cows and the development of other non-breeding beef or sheep enterprises and/or other farm enterprises).	Estimated 0.6 Mt CO_2 eq per 100,000 suckler cows (and followers) removed. *Note that this is an indicative calculation only, not a policy recommendation.	The indicative income foregone per suckler cow removed is estimated at €1,080 for farms exiting. * Note that this is an estimate only, not a recommendation. The level of public funding for any scheme would be a matter for further consideration.	All	Short term
9 – Voluntary Extensification Scheme (reduction in the number of suckler cows and the development of other non-breeding beef or sheep enterprises and/or other farm enterprises).	Estimated 0.6 Mt CO_2 eq per 100,000 suckler cows (and followers) removed	The indicative income foregone per suckler cow removed is estimated at €1,350 for farms reducing.	All	Short term

	*Note that this is an indicative calculation only, not a policy recommendation.	* Note that this is an estimate only, not a recommendation. The level of public funding for any scheme would be a matter for further consideration.		
Measures 8 and 9 would provide additional reductions.	**Impact of Measure 8 & 9 depends on the level of participation in a voluntary scheme.**			

Enabling measures to support mitigation of Greenhouse Gas Emissions from the beef sector		
Measure	**Target GHG**	**Timeframe**
10 – Develop package of supports to incentivise the implementation of the measures set out in this report	All	Short-Medium term
11 – Establish robust methodologies for measuring and monitoring GHG emissions and removals at individual farm level.	All	Short-term
12 – Commission a study on a carbon farming framework.	All	Short-term
13 – Improve Nitrogen Use Efficiency – Liming and soil pH- Ensure 90- 100% of beef farms are soil testing for pH.	Nitrous Oxide	Short-term
14 – Encourage clover adoption and MSS. Ensure all farmers have incorporated clover/multispecies on 20% of their farm grassland by end of 2025.	Nitrous Oxide	Short-term
15 – Increase adoption of Low-Emissions Slurry Spreading (LESS)- target 80 - 90% adoption of LESS for all beef cow slurry manure by 2025.	Nitrous Oxide	Short-term
16 – Introduce Animal Health Measures listed in action 314 of the Climate Action Plan 2021.	Methane	Short-Medium term
17 – Develop Energy Diversification Opportunities.	All	Medium-Long term
18 – Design a Climate Action Communications Strategy.	All	Short-term
19 (a) Increase investment in climate change research and in Knowledge Transfer 19 (b) Establish an Agriculture and Climate Change Research Liaison Group.	All	Short-term
20 – Develop enhanced integration between the beef and dairy sectors.	All	Short-Medium term
21 – Support the role of young farmers and women in agriculture in implementation of the measures set out in this report.	All	Short-Medium term

Chair's Foreword

The ravaging impact of climate change is becoming more visible day by day with a growing number of extreme and catastrophic global weather events being recorded in 2022. The effects of climate change are felt most in the world's poorest countries with an estimated 130 million people being pushed into poverty and a further 200 million displaced if we do not take rapid action to tackle global warming. As a developed country, Ireland is well positioned to play its part in combatting climate change and the Climate Action and Low Carbon (Amendment) Act 2021 sets out an ambitious plan to reduce greenhouse gas emissions from all sectors of the Irish economy.

The sectoral target for agriculture is to reduce greenhouse gas emissions by 25% (or an estimated 5.75 Mt CO2 eq) by 2030. The Food Vision Beef and Sheep Group was established, along with the Dairy group, to chart a path for the sector to meet this challenging target. Despite the challenges, members of the Food Vision Beef and Sheep Group have engaged in constructive debate and have demonstrated their commitment to the common goal of identifying measures which can reduce emissions from the beef sector while also protecting the viability of the more than 80,000 farm families engaged in beef production in Ireland. The variety of production systems and conditions in the beef sector, coupled with the precarious economic situation on many farms, makes the identification of such measures particularly difficult. Furthermore, the socio-economic and demographic challenges within the sector may constrain the widespread adoption of mitigation measures.

Over the course of our deliberations, the Group has reviewed and debated a broad range of potential measures. Arising from this process, this report identifies 9 direct measures that can reduce greenhouse gas emissions and a further 12 enabling measures that are necessary to incentivise the adoption of the direct measures. Research suggests that measures 1 to 7 can potentially deliver a reduction in greenhouse gas emissions of up to 2.18 MT, while maintaining animal numbers. When combined with the measures set out in the Food Vision Dairy report and assuming these measures are fully implemented, it is estimated that an emissions reduction of up to 4.28 MT is possible without a reduction in animal numbers, taking us a long way towards our overall target of 5.75 Mt CO2 eq. Measures 8 and 9 include voluntary diversification and extensification proposals aimed at supporting farmers that reduce suckler cow numbers and engage in other farm enterprises.

Significant reservations were expressed by both farm organisations and the meat industry in relation to the financial impact of many of the measures. Measures 8 and 9 were particularly contentious, with

some stakeholders rejecting their inclusion in the final report due to the wider economic and social impact of reducing suckler cow numbers. Stakeholders have reserved their position on the final report until there is a commitment for state funding to support the measures. These concerns and reservations are articulated throughout this report, and it is important to note that INHFA withdrew from the process of the start of the seventh meeting.

An estimate of the economic costs of each of the 9 direct measures is also presented. While further analysis is required to verify some of these costs, it is clear that certain measures will lead to additional costs and/or a potential loss of income for farmers and others across the supply chain. In a sector that is already operating at very low levels of profitability, it was made clear by all stakeholders that a package of financial supports would be required to incentivise the adoption of certain measures. Indeed, this is called out as a key enabling measure (measure 10) in the report.

While this report identifies measures that can assist Ireland in tackling climate change, there was clear consensus among the stakeholder that further analysis and consultation is required for the design of appropriate policy interventions and schemes that can stimulate the transformational change that is required in the sector to meet the emissions reduction target.

I acknowledge that this has been a very difficult process for all involved with no 'silver-bullet' solutions emerging. I would like to thank the stakeholders, state agencies and Department officials for their constructive and respectful engagement in this very important process and their contributions to the production of this final report.

Professor Thia Hennessy

1. Introduction

The Food Vision Beef and Sheep Group was established by the Minister for Agriculture Food and the Marine in June 2022. The membership of the Group comprises representatives from the farm organisations, the meat processing sector, all relevant state agencies, academics and Department officials (see Appendix 1 for the membership of the Group).

The agriculture sector as a whole was directly responsible for 37.5% of national GHG emissions in 2021.[1] On an individual farm, and farm-type basis, there is evidence of exemplary and low impact practice. However, taking the agricultural sector as a whole, the increase in agricultural output in recent years, particularly in the dairy sector, has happened at the expense of the environment. This is evidenced by the trends in water quality, biodiversity and in Greenhouse Gas (GHG) and ammonia emissions. This is one of the key messages of the EPAs latest State of the Environment report (SoER) (EPA, 2020), and the July 2021 publication of Ireland's Provisional Greenhouse Gas Emissions 1990-2021. Urgent and effective action is needed to address these trends.

Following on from the Climate Action and Low Carbon (Amendment) Act 2021 hereafter referred to as the Climate Act 2021, in July 2022, the Government agreed ceilings for emissions from each sector of the economy to deliver a pathway towards a 51% reduction in total emissions by the end of 2030.

The ceiling set for the agriculture sector will require that its emissions do not exceed 17.25 Mt CO_2 eq. by the end of 2030, compared to a 2018 baseline of 23 Mt CO_2 eq.[5]. This will require a reduction in emissions of 5.75 Mt, or 25%, compared to 2018. Implementation of both Methane (CH_4) and Nitrous Oxide (N_2O) emissions reduction measures will be required to meet this target.

In addition to regulatory requirements, the consumers and trade customers for Irish meat products and ingredients all around the world are increasingly demanding proof of environmental sustainability and climate action. The Origin Green programme, which includes farm carbon footprinting and farmer feedback reports, as well as sustainability targets for food companies and retailers, is a key asset in relation to maintaining and growing the value of Irish beef exports. However, these efforts will be undermined if total carbon emissions associated with meat production do not decline.

[1] https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/#

The initial task of the Food Vision Beef and Sheep Group is to identify measures that the beef sector can take to contribute to reducing emissions from the agricultural sector. The focus of the Group has been exclusively on agricultural activities associated with emissions that are counted in the agriculture component of the national GHG inventory. Land use, land use change and forestry (LULUCF) has been allocated a separate target under the Climate Action Plan; a point noted throughout the group's deliberations, and is not considered in this report.

A Progress Report from the Chair was submitted to the Minister on the 2nd of November with an update of the work of the Group at that stage including a preliminary list of 20 potential measures for the beef sector. This Final Report builds on that update and provides the key impact metrics and an additional measure bringing the total to 21.

Overview of Stakeholder positions

This Report has been prepared through a process of collaboration and cooperation. The measures set out in Section 6 of the Report were discussed in detail among the Group. Not all measures received unanimous agreement, with significant reservations expressed from both farming organisations and the industry in relation to the financial impact of some of the measures and the wider economic impact on the viability of the sector of specific measures.

In relation to the measures outlined in the report the following is an overview of the farmer representative and industry stakeholder positions:

Throughout the process, stakeholders cited the need for clarity around the potential funding available to implement the measures being proposed. The Chair clarified on several occasions that the purpose of the report is to identify actions which the beef sector can take to contribute to meeting the GHG emissions reduction target set for the agriculture sectors. DAFM officials were clear that the identified measures are being proposed for consideration and further analysis with the understanding that further development is needed through schemes, funding mechanisms, whether public or private, and legislation as appropriate. It was made clear that measures need to be identified before this can happen.

The risk of carbon leakage resulting from reduced production in Ireland being replaced by increases in production in countries with less environmentally efficient production systems was raised throughout the course of deliberations by stakeholders. This issue is outside the scope of this Report.

The risk of the potential for land abandonment from measures 8 & 9 on voluntary extensification and diversification were raised by some stakeholders and this comment is reflected in the text of the measures. Further, the impact that a reduction in animal numbers and throughput would have at all stages of the supply change and on the overall viability of the sector was raised.

The **ICMSA** reserved its position on the entire report. The ICMSA raised an objection to Measure 5 on the reduction of chemical nitrogen and an overall objection on the costs and income reductions that farmers will incur and stated a requirement for a significant increase in the level of funding to support farmers implementing the measures and in supporting the integration of dairy and beef systems.

The **ICSA** reserves its position on the entire report due to the lack of concrete commitments around funding for the measures. The ICSA is not supportive of measures which lead to reduced output, in the absence of a coherent plan to support viable suckler, beef and sheep systems. ICSA will only engage further if there is a commitment from the relevant ministers (agriculture, climate and public expenditure) to sit down with the Food Vision group to negotiate a way forward.

The **IFA** reserved its position on the entire report pending commitments around funding for the implementation of the measures. The IFA is not supportive of measures which will result in a reduction in output. It has called for an enabling measure to support the economic viability of the suckler sector.

The **INHFA** withdrew from the process at the start of the seventh meeting.

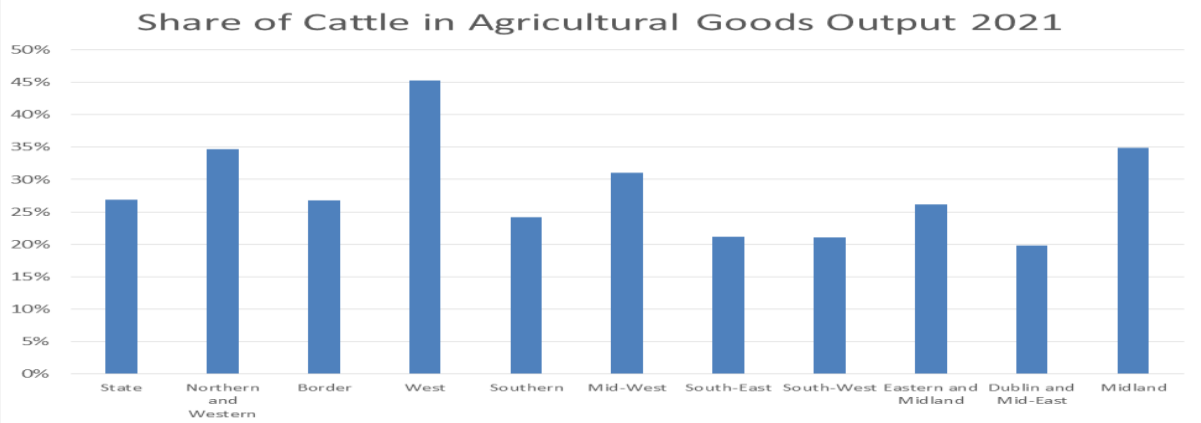
MACRA reserved its position on the entire report due to the lack of commitment to funding outlined in the report, the lack of clarity around certain figures in relation to emissions reduction, and Macra also rejected measures 5, on the reduction of chemical Nitrogen and 8, and 9 on voluntary extensification and diversification.

Meat Industry Ireland (MII) members oppose the inclusion of measures 8 and 9 in the Chair's Final Food Vision Beef and Sheep Report, as their inclusion will significantly undermine the industry. It would lead to an annual loss of output and revenue with a resultant impact on the rural economy. MII note that FAPRI forecasts a natural fall of some 3% per annum to 2030 in the suckler herd, which would result in achieving in the same period the scale of removals modelled in the Draft Food Vision Beef Report. The cost to the State to accelerate this process would be better spent in greatly accelerating the overall reduction in emissions when applied to measures such as early finishing, genetics, genotyping of animals, improved husbandry/productivity as well as the incentivisation of

specific measures in the MACC to support farm level adoption. MII is requesting that a full evaluation of the implications of these measures be published and discussed with stakeholders in the Beef Vision Group before finalising the Group's report.

2. Economic Significance of the Beef Sector

The Census of Agriculture 2020 from the CSO showed that 74,200 farms in Ireland were specialist beef producers, representing 55% of all farms in Ireland. Of these, 34,200 (46%) were in the Northern and Western regions, 26,800 (36%) were in the Southern region and 13,200 (18%) were in the Eastern and Midland regions. 45% of goods output in the Western region was from cattle (see chart below). Almost half of specialist beef production farms were between 10 and 30 hectares (49%) compared to an average farm size nationally of 33.4 hectares.



The Teagasc National Farm Survey (NFS) collects data on the economic performance of farms assigning a farm system to them on the basis of their dominant contributor to their standard output. For example, the cattle rearing system refers to those farms where the greater proportion of the farm's activity relates to suckler beef production. There were 17,989 such farms represented in the 2021 NFS sample. Cattle other farms sampled represented 30,283 farms in 2021 where cattle finishing would be the dominant enterprise.

There are many other farms that will also have a cattle enterprise but where it is not the main enterprise, reflecting the mixed nature of many farms. The NFS sample represents a population of c. 85,000 farms all which have greater than €8,000 of standard output. The other 50,000 farms in Ireland would be smaller than this threshold, and are captured in the Teagasc Small Farm Survey, the last of which was published in 2017. Cattle farming is also the predominant enterprise on these farms with 61% categorised as cattle farms which implies approximately 30,500 farms.

Beef worth over €2.4 billion or 451,540 tonnes was exported from Ireland in 2021 according the DAFM Annual Review and Outlook 2022. Figures from FAO (2020) indicate that Ireland was the 8th largest exporter of boneless beef and veal in the world in 2020. The output value at farm gate prices of the cattle sector in 2021 was €2.58 billion up from €2.29 billion in 2020. There are currently 33 DAFM

approved processing plants[2] authorised to process bovines and there are additional local authority approved processing plants[3]. Total slaughterings in 2021 in Ireland were 1.8 million head worth €2.4 billion. This accounted for 8.7% of total EU27 slaughterings in 2021. In 2021 Grant Thornton, on behalf of the beef Taskforce estimated the value of beef processing as an average of 2018 and 2019 was €2.92 Billion including beef for domestic consumption and for export, with the farmgate value of the animals in that period estimated at €2.28 Billion.

Clearly the processing sector has a key role in the cattle sector and offer employment in regions where other opportunities may be more limited. Eurostat data estimated c. 20,000 jobs were in meat manufacturing in Ireland in 2019. accounting for nearly 20% of employment in manufacturing industry. Total employment in the agri-food sector in 2021 was 170,400 or 7.1% of national employment. Employment in these sectors is directly dependent on domestic agricultural output levels and is relatively less import-intensive than other sectors of the economy.

The key inputs for Irish food manufacturing industry are sourced domestically. Therefore, these areas of employment are sensitive to fluctuations in the level of primary production activity, as well as the domestic economy more broadly. Accordingly, changes in agricultural activity are likely to lead to proportionately larger employment effects than would arise in other sectors of the economy more generally.

The multiplier effect of agricultural output is relatively high compared to other domestic sectors due to its integral ties to the wider domestic economy. The CSO multiplier estimate for Agriculture, Forestry and Fishing (AFF) in Ireland is 1.495. Significant changes in beef production would impact on the value of the agriculture sector and farm household income but would also impact on output and employment in relation to agricultural inputs, the beef processing sector and wider economic output, employment and income in the general domestic economy.

The overall marginal employment multiplier for primary Irish production has been estimated by Hennessy et al[4], using 2012-2014 CSO data, at c. 16 jobs per additional million Euros of Agriculture, Forestry and Fishing output. However, there is some uncertainty around the direct, indirect and/or

[2] https://www.gov.ie/en/publication/31ea3-dafm-approved-establishments/
[3] https://www.fsai.ie/food_businesses/approved_food_establishments.html
[4] Hennessy, T., Doran J., Bogue, J. and Repar, L. (2018) *The Economic and Societal Importance of the Irish Suckler Beef Sector*, pp.38-40, Tables Seven and Eight. This peer-reviewed report was published by the Irish Farmers Association.

induced effects of changes in agricultural output value in terms of employment. Teagasc analysis[5] has examined the foregone economic impact and employment impacts of a range of emissions reductions scenarios for the agri-food sector as a whole.

[5] Hanrahan, K. and Donnellan, T. (Forthcoming) Impact of GHG Scenarios on Agricultural Activity, Output, Input and Income in Agriculture and Employment in the Agriculture and Food Processing Industries, p.12. Teagasc.

3. Overarching Factors Governing the Group's deliberations

It is accepted by the Group that there is a need to significantly step up the implementation of new and existing measures if the 2030 targets for emissions reductions are to be achieved. These measures must be capable of being monitored and verified, so that they can be included in the national greenhouse gas emissions inventory. In its National Projections report [6] the EPA highlighted the need for more explicit quantification of what each methane reduction measure is expected to achieve and details of the planned implementation pathway.

It is however, crucial when considering sustainable development of the sector to consider the maintenance of primary producers' economic viability not only in terms of their ability to make a return for their endeavours, but also in helping to deliver on environmental and social sustainability. Social factors such as generational renewal, gender balance, education and training and wellbeing are important considerations in the context of this report. It follows therefore that the necessary actions that must be taken to reduce agricultural emissions from the beef sector have to be carefully considered so as not to undermine what is a vitally important driver of economic and social development in rural Ireland.

The group is conscious of the fact that the beef sector does not operate in isolation and there is significant interplay between the beef and dairy sectors, as over half of the annual beef output originates from the dairy herd. It is for this reason that the report considers the importance of enhancing and working to optimise the integration between the beef and dairy sectors.

The Irish beef sector accepts that it must modify its way of doing business if it is to contribute to the achievement of the demanding emission targets set for the agriculture sector. In doing so, the Group recognises that the Irish beef industry should be given the opportunity and should be supported financially to facilitate the transition. Livestock agriculture is fundamentally different to other economic sectors. In being prepared to change its farming practices, the industry is clear that a strict adherence to scientific developments should govern this transformation.

[6] EPA-Ireland's-GHG-Projections-Report-2021-2040v4.pdf

The science around biogenic methane is evolving and becoming clearer. A reduction of approximately 3% in biogenic methane emissions per decade would be sufficient to neutralise its impact on further increases in global temperature. It is recognised that it will take a considerable length of time following stabilisation for the impact on global warming to be realised and that a reduction to net zero emissions from enteric fermentation is not feasibly attainable.

It is globally accepted that methane emissions must fall from all sources, be it fossil methane or biogenic methane generated from livestock and paddy rice cultivation. Falling methane emissions will have a cooling impact on the earth's climate. It is recognised that different sectors have different capabilities when it comes to reducing methane emissions. The Irish Government should continue to engage with global experts to ensure that National, EU and international policy reflects the latest science.

The Group recognises that a reduction of emissions associated with enteric fermentation is an absolute requirement for the achievement of the sector's carbon budgets under the Climate Act process. A number of proposed measures within this report will be crucial to the achievement of this objective in the short term. In the medium to long term, the adoption of scientific developments that can lead to reduced methane emissions per animal will play an important role, and it is clear that research investments in this area need to be scaled up.

The potential impact of any future disruption to live exports on the capacity of the measures proposed to deliver on the necessary emissions reductions is noted by the group as a risk factor. The volume of live cattle exports in 2021 was 247,163 [7] , of which over 140,000 were calves. [8.] Disruption to this trade could substantially increase the volume of emissions nationally.

Further noted by the group is the relatively low profitability of the beef sector. According to the Teagasc 2021 National Farm Survey[9], cattle rearing systems had lower incomes and margins than all other key farming systems. While this is also accompanied by lower debt levels, the average age of a specialist beef producer is 58 according to CSO data, with the age profile of all farmers shifting over the last generation. The proportion of farmers under 45 has shifted to 20.8% in 2020 from 33.1% in 1991[10]. This highlights the need for measures proposed in this final report to be developed taking account of both the economic and demographic challenges in the sector and the potentially limited

[7] DAFM meat market report week 52 2021
[8] Beef Carcase Classification and Price Reporting - Annual Report 2021
[9] Teagasc NFS 2021
[10] https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020-preliminaryresults/demographicprofileoffarmholders/

capacity to make the necessary investment to adopt new technologies and work practices. The availability of appropriate supports from government and or industry to facilitate uptake is a key consideration in the further development of these measures.

Thus, four overarching factors have governed the Group's response to its work.

- First the imperative of adhering to the best scientific advice in selecting direct measures and in estimating the associated economic costs,
- second the need to maintain and enhance the Irish beef industry from the farm to processing sector as a key contributor to the economy and social fabric of rural Ireland,
- third, the recognition that many of the Group's recommendations will have crossover implications for other ruminant sectors, and
- fourth the need to consider the cost of implementation of direct measures, where it will be borne and what resources will be required to incentivise the transition.

In this context, the Group expects that the beef sector will work with the other sectors in the development of an integrated strategy to promote and support climate change mitigation and sustainability best practice.

The Group also emphasises the critical importance of ensuring the maintenance of livelihoods for current and future generations of Irish beef farmers. In particular, there is a need to support generational renewal and young farmers and women in agriculture, who can adapt positively to the changes set out and technologies described in this report.

4. Goals of the Food Vision Beef Group

This Group has been established to advance the actions for the beef and sheep sector identified in the Food Vision 2030 strategy, taking account of the requirement for the sectors to contribute to achieving the targets set for the agriculture and land use, land use change and forestry (LULUCF) sector in the Climate Action Plan 2021.

The establishment of the Food Vision Beef and Sheep group was announced by the Minister for Agriculture Food and the Marine on 1st June 2022. The group, chaired by Professor Thia Hennessy, UCC, has met 7 times in the full group format between mid-June and mid- November 2022, in addition to six bilateral meetings.

The Group's first priority is to fulfil the Food Vision commitment, which was to 'produce a detailed plan by Q2 2022 [delayed to Q4 2022] to manage the sustainable environmental footprint of the beef sector, including minimising total emissions, while making a positive contribution to improved water quality and biodiversity, in line with government policy'.

The terms of reference for the Group are as follows:
The Group has been tasked to provide an initial report to the Minister by end September [delayed to October] setting out how emissions associated with the beef sector can be reduced; with a final plan to be submitted by end November 2022.
The group will focus on beef exclusively up until the submission of the plan for the beef sector, after which the focus of the group will be on the remainder of the actions identified in Food Vision for both sectors.

This report specifically focusses on agricultural activities associated with emissions that are counted in the agriculture component of the national GHG inventory. Land use, land use change and forestry (LULUCF) has been allocated a separate target under the Climate Action Plan; a point noted throughout the group's deliberations.

5. Trends in Emissions and Targets

a) Sectoral Emissions and Targets

The Government has agreed ceilings for emissions from each sector of the economy to deliver a pathway towards a 51% reduction in total emissions by end of 2030.

The ceiling set for the agriculture sector will require that its emissions do not exceed 17.25 Mt CO_2 eq. by the end of 2030, compared to a 2018 baseline of 23 Mt CO2 eq. This will require a reduction in emissions of 5.75 Mt, or 25%, compared to 2018.

The implementation of both Methane (CH_4) and Nitrous Oxide (N_2O) emissions reduction measures will be required to meet this target.

While the Land Use, Land Use Change and Forestry (LULUCF) sector, which has a separate target, is clearly of relevance to the beef sector, the focus of the Group is on the agriculture GHG inventory and ensuring that the beef sector reduces its sectoral emissions

Table 1- Climate Action Plan 2021 sectoral reduction targets, updated with Government announcement of July 2022

Sector	2018 emissions (Mt CO_2 eq.)	Sector emissions reduction targets set in July 2022 (Mt CO_2 eq.)	Sector percentage reductions targets set in July 2022
Electricity	10.5	3	75%
Transport	12	6	50%
Buildings	9	1 (commercial and public) 4 (residential)	45% (commercial and public) 40% (residential)
Industry	7.9	4	35%
Agriculture	**23**	**17.25**	**25%**
LULUCF	4.8	Deferred for 18 months to allow for the completion of the Land-Use Strategy.	Deferred for 18 months to allow for the completion of the Land-Use Strategy.

Other**	2	1	50%

** = F-gases, Petroleum Refining and Waste

A further 5.25 Mt CO_2eq. of annual emissions reductions are currently unallocated on an economy-wide basis for the second carbon budget period (2026-2030). These will be allocated following a mid-term review and identification of additional abatement measures. This approach is consistent with both the Programme for Government and the Climate Act 2021.

b) EPA Emissions Data

The EPA publication Ireland's Provisional Greenhouse Gas Emissions 1990-2021[11] shows that total emissions from the agriculture sector in 2021 were 23.1 Mt CO_2eq, an increase of 3% on 2020.

Methane (CH_4) emissions originate from Enteric Fermentation, Manure Management and fuel combustion. In 2021, methane emissions contributed 69.6% of Agriculture sector emissions, and have increased by 1.8% since 2020. Nitrous Oxide (N_2O) emissions originate from Manure Management, Agricultural Soils and fuel combustion. In 2021, N_2O emissions contributed 24.8% to the Agriculture sector, and have increased 3.4% since 2020. Carbon dioxide emissions originate from Liming, Urea Application and fuel combustion. In 2021, CO_2 emissions contribute 5.6% of Agriculture sector emissions, and have increased by 17.3% since 2020.

Increasing methane emissions are evident in the gas share trend, 16.1Mt CO2 eq. (69.6% share) in 2021 compared to 13.5Mt CO2 eq. (67.2% share) in 1990, an increase of 19.3%. The current situation indicates methane emissions from agriculture are steadily increasing due to increased production.

Agriculture emissions by source category and by gas are presented in Figures 1 and 2.

[11] Ireland's Provisional Greenhouse Gas Emissions 1990-2021: Monitoring & Assessment: Climate Change: Air emissions Publications | Environmental Protection Agency (epa.ie)

Figure 1. Trend in Agriculture 1990-2021

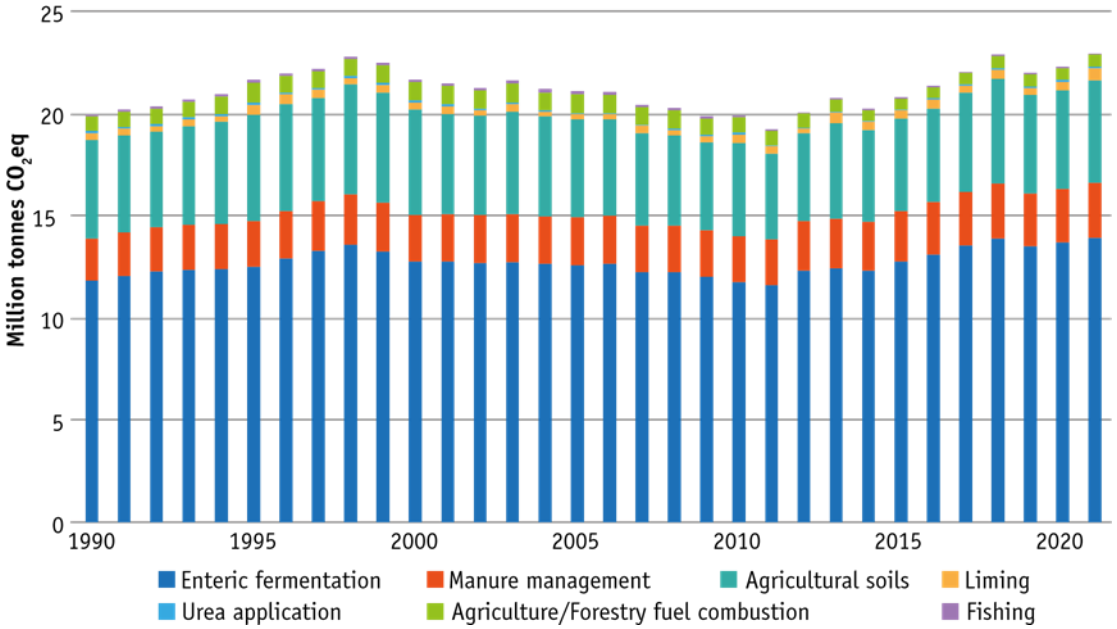


Figure 2. Trend in Agriculture, by Gas 1990-2021

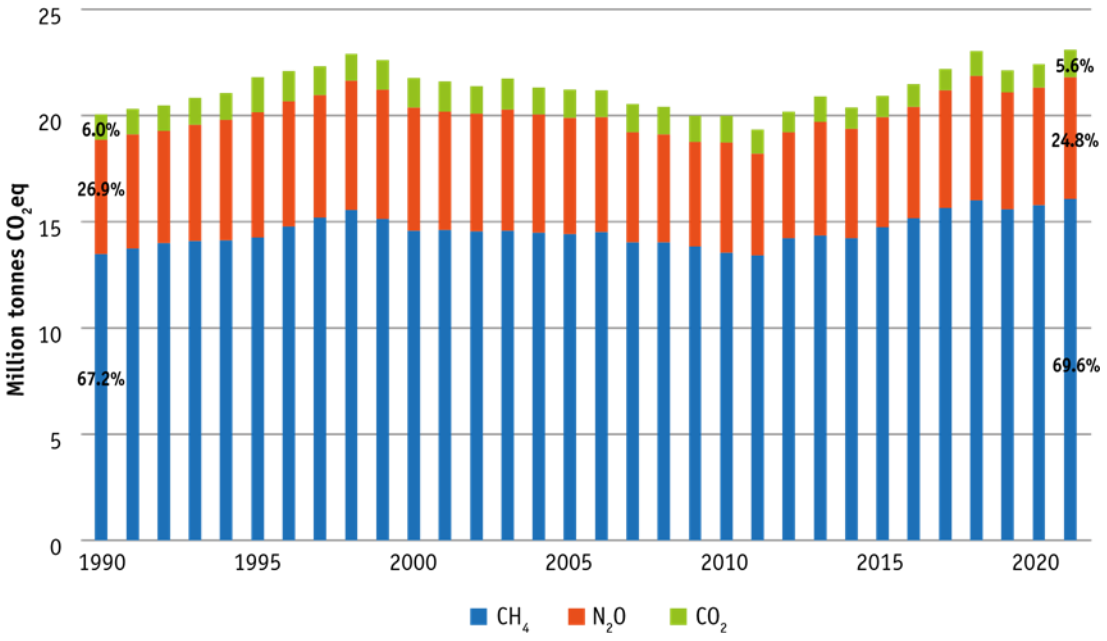
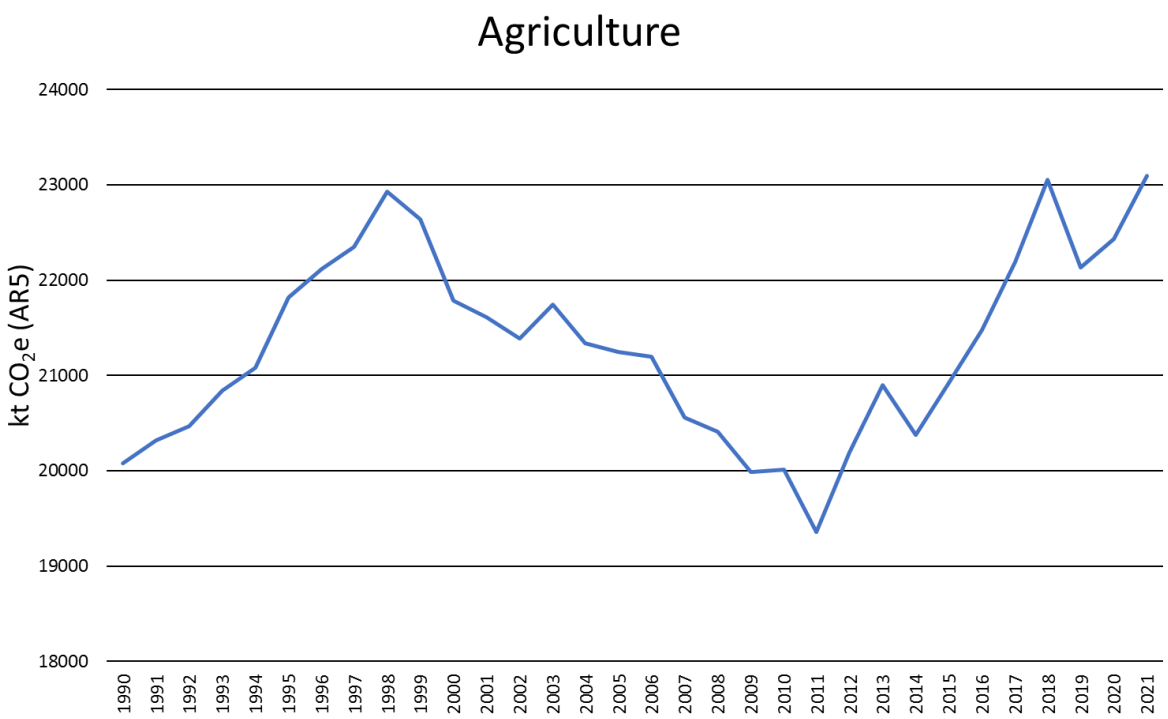


Figure 3 Agricultural emissions CO2 equivalent (including fuel combustion) [12]



c) Projections of cow numbers, production and emissions

The Teagasc FAPRI-Ireland model generates projections of animal numbers, fertiliser use and crop areas on a regular basis. These projections are provided to the EPA on an annual basis and used in the sectoral forecasts of overall national emissions. The EPA published its 2022 Greenhouse Gas Projections in July 2022. The FAPRI model's forecasts out to 2030 are shown in Figures 4 – 6. These forecasts show that suckler cows are likely to decline to just over 600k head by 2030 (Figure 6. Average June and December figures).

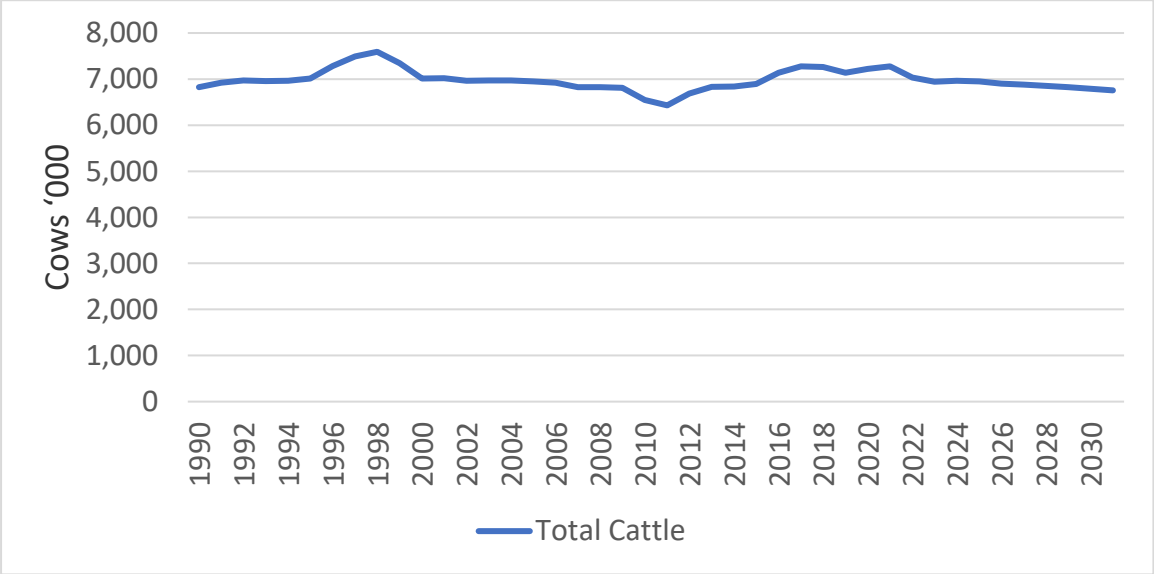
The EPA National GHG projections 2021 – 2024 showed that under the "with existing measures" scenario, emissions from the agricultural sector are projected to increase by 1.9% over the 2020 – 2030 period.

[12] Sources: Climate Change Advisory Council Carbon Budget Digest file and EPA GHG emissions estimates file (2021):
https://www.climatecouncil.ie/media/climatechangeadvisorycouncil/contentassets/documents/cbcbackgroundpapers/Carbon%20Budget%20Scenario%20Digest.xlsx
https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/GHG_Final-emissions-data_1990-2020_AR4_web.xlsx

These forecasts are conditional on assumptions regarding energy prices, and fertiliser prices as well as economic growth rates that prevailed prior to Russia's illegal war in Ukraine. The war has led to substantial increases in fertiliser prices and to a lesser extent in animal feed prices, that would be expected to further dampen growth expectations for cow numbers, production and emissions.

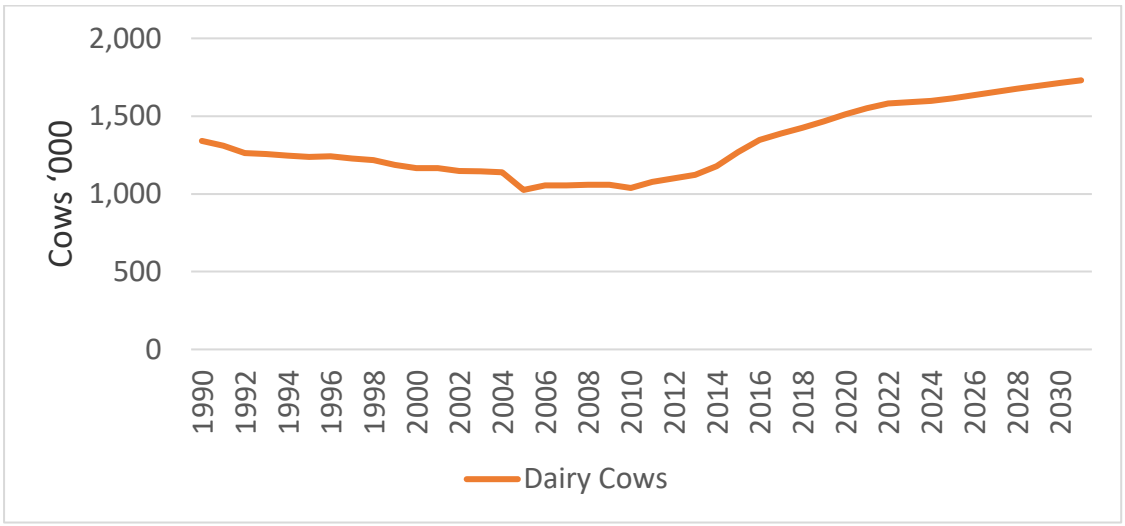
It is recognised that over two-thirds of Irish agriculture agricultural emissions comes from methane, the attainment of the sector's emissions reduction targets cannot be achieved without a significant reduction in methane emissions.

Figure 4 - Total Cattle numbers



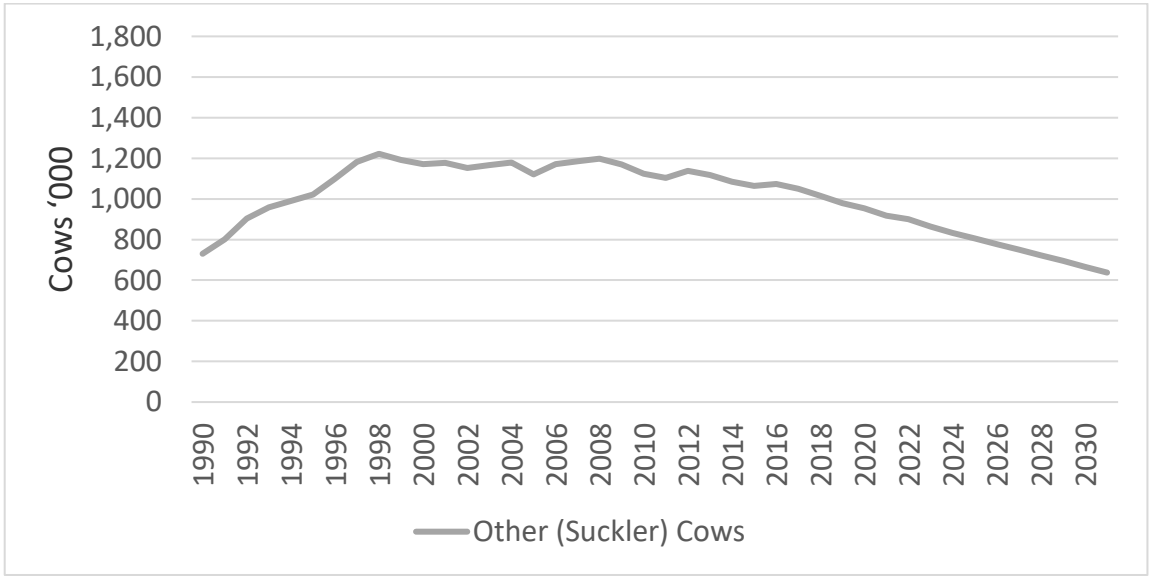
Source: CSO and FAPRI-Ireland model (2021)

Figure 5 - Total Dairy Cows



Source: CSO and FAPRI-Ireland model (2021)

Figure 6 - Total Suckler Cows



Source: CSO and FAPRI-Ireland model (2021)

d) Fertiliser use

Ireland's Fifth Nitrates Action Programme (NAP) has several measures that complement the measures set out in this report[13].

The proposed National Fertiliser Database will provide for accurate tracking of fertiliser sales and will assist with the regulation of the fertiliser industry. This will contribute to the national targets to reduce fertiliser use and encourage improved nutrient use efficiency. Recording fertiliser sales data at farm level within a national database will improve recording of quantities used and improve traceability regarding fertiliser use.

Table 2 sets out how chemical nitrogen is used across the sub sectors of Irish agriculture.

Table 2 – Approximate chemical nitrogen use per agriculture subsector*

Total 2021	Dairy	Beef and sheep	Tillage
399,000	200,000 (50%)	140,000 (35%)	60,000 (15%)

*Data from Teagasc National Farm Survey 2021

[13] These include the planned development of the Register of Chemical Fertiliser sales; improvements in compliance and enforcement such as an increase in derogations inspections from 5% to 10% and strengthening enforcement; chemical fertiliser control will start with a 10% reduction in the grassland application of chemical nitrogen limits applied nationally and may be increased to a 15% reduction nationally after the midterm progress review of the programme; increasing adoption of Low Emission Slurry Spreading (LESS); soil testing; limits on crude protein content in concentrated feeds; and amendment to livestock excretion rate bands.

e) Summary of MACC (Marginal Abatement Cost Curves) meaures

Teagasc researchers have performed an analysis of abatement potential for greenhouse gas emissions in Irish agriculture for the commitment period 2021-2030, this has led to the development of the Marginal Abatement Cost Curve which aims to identify the most cost-effective ways to generate abatement.[14] The development of the MACC is an iterative process and a revised MACC will be published in the coming months. The following is a summary outline of the mitigation measures currently incorporated in the MACC.

The current MACC report is based on 25 Mitigation Measures across

- Agriculture
- Land Use, Land Use Change and Forestry
- Bioenergy

Agriculture measures in the MACC can be broken into two groups:

Emissions intensity measures: Only deliver aggregate reductions if increased efficiency leads to reduced activity levels.

Absolute measures: Reduce Emission Factors and reduce emissions even where activity is increasing Given the path of projected agricultural activity levels presented at the first meeting of the Group the focus is on absolute measures.

The principal GHG emissions from Irish agriculture are Methane (CH_4) and Nitrous Oxide (N_2O).

The absolute measures in the MACC are mostly measures that *mitigate emissions of N_2O.*

Measures are assumed to be phased in over the period 2021-2030.

Most mitigation as modelled in the MACC occurs during the second budgetary period

- 1st budget period 3.42 MT CO2e cumulatively across measures for 2021-2025
- 2nd budget period 8.01 MT CO2e cumulatively across measures for 2026-2030

[14] Return of the MACC

Key measures are

- Fertiliser type
- Clover in Grass Swards
- Drainage (Mineral Soils)
- Low Emissions Slurry Spreading (LESS)
- Acidification of slurry

These five measures account for 85% of modelled mitigation

Other MACC measures to 2030 are:

- Slurry Acidification
- Lipids
- Protein in pig feeds

Other Measures – MACC+ & MACC++ which will be the future iterations of the MACC

- Feed additives at housing that reduce enteric Methane e.g., 3NOP
- Earlier Slaughter of Cattle
- Feed additives at grass
- Low emitting animals

The Group are largely supportive of the MACC measures Teagasc outlined for mitigating emissions and the overview of the process of refinement to MACC+ and MACC++ in the future.

A framework for the mitigation of emissions needs to be developed and implemented as soon as possible. This framework will include MACC measures which are evolving based on the latest research in the respective areas.

6. Proposed Measures

This section, and the accompanying tables, outline two categories of measures identified for climate-positive actions for the beef sector.

Direct Impacts and Enabling actions

In considering climate-positive measures it is useful to distinguish between direct impact measures on GHGs which can be counted in the national agriculture inventory and enabling actions which, while not directly attributable to GHG reductions in the inventory, support the adoption of the direct measures.

Key to table of measures

Estimated CO_2 equivalent reduction: this column indicates estimated emissions reductions associated with the recommended measures by converting amounts of other gases to the equivalent of carbon dioxide with the same global warming potential (GWP).

Estimated Economic Costs at farm level: this column includes estimated economic costs at farm level of adopting the measure proposed. The estimates of economic costs presented here should not be interpreted as the level of public subsidy required to implement the measure. Most of these measures will require support from farmers, industry and Government, and the share of public funding required for each measure is beyond the scope of this report. Meat processor representative stakeholders have also flagged concerns that a reduction in throughput from the implementation of some measures will have an economic impact all along the supply chain.

Target GHG: this column indicates which category of Greenhouse Gas will be targeted within the inventory by the recommended measure. It should be noted that all targets set out in this final report are indicative and yet to be fully determined.

Timeframe*: this column provides an indicative timeframe in line with the Climate Change Advisory Council budget periods.

Short-term	2021-end 2025	First carbon budget period
Medium-term	2026-end 2030	Second carbon budget period
Long-term	2031+	Third and subsequent carbon budget periods

Direct Impact measures to mitigate Greenhouse Gas Emissions from the beef sector				
Measure	**Estimated CO_2 equivalent reduction**	**Estimated economic cost at farm level**	**Target GHG**	**Timeframe**
1. Improving live weight performance for beef cattle resulting in earlier slaughter ages, reducing age of slaughter by between 2.7 and 3.9 months on average, from 2018 average of 26 months to 22-23 months on average by 2030.	0.57 – 0.82 Mt CO_2 eq	Estimated to have a positive economic effect at farm level with some potential loss in tonnage for the processing sector. Farm-level investment in weight recording and improvement in farm management practices are required	Methane	Short/Medium
2. Reduce age at first calving of suckler beef cows by between 2.0 to 3.8 months compared to 2018	0.05 – 0.10 Mt CO_2 eq	Estimated to have a positive economic effect at farm level	Methane	Short/Medium
3 - Development of methane-mitigating feed technologies.	0.15 – 0.3 Mt CO_2 eq	The cost per animal is €25.55 per head of cattle per year based on a price per kg of 3NOP that is assumed to be €80kg. Total estimated aggregate cost is €11.3m. If we were to include the new technology and assume that the efficacy increases to 20% with the new technology, and the uptake assumption is 25% of all non-dairy bovines then the mitigation from the beef system increases to 0.303 MtCO2 eq . The aggregate costs increase to €29m per annum.	Methane	Short/Medium
4 - Target a 90% replacement rate of CAN with Protected Urea by the end of 2025 for grass-based beef production systems	0.2 Mt CO_2 eq	No additional cost Protected Urea is cheaper than CAN on a cost per kg of Nitrogen basis and while it may appear slightly dearer than standard Urea, it provides the same "effective N" for the plant as Urea at a 12% lower spreading rate.	Nitrous Oxide	Short-term
5- Reduce chemical Nitrogen use in the beef sector by 27% - 30% on average by 2030, with interim target of 22 - 25% by 2025.		Teagasc analysis into Nitrogen reduction and its impact on profitability per hectare in the dairy sector is currently being	Nitrous Oxide	Short-term Medium-term

(This is a reduction from approximate usage in 2018 by the Beef and Sheep Sector of 143k tonnes to 104k - 100k tonnes by end of 2030)	Up to 0.26 Mt CO_2 eq by the end of 2030	updated to take account of enabling measures available to maximise Nitrogen use efficiency which mitigate against this cost. A parallel exercise is required focussing on the beef sector.		
6 – Increase area under Organic beef production to 180,000 ha by 2027	0.2 Mt CO_2 eq	€37 million of public funding to support the transition to organics has been provided under the CAP Strategic Plan 2023-2027 Further research is required to establish the price premium available in the market for organic beef.	All	Medium-term
7.a) Develop methane mitigating Breeding Strategies (carbon sub-index) 7.b) Develop methane mitigating Breeding Strategies (building efficiency traits)	0.1 - 0.3 Mt CO_2 eq	Genotyping strategy initial costs is estimated by ICBF at €10.1 m per annum with cumulative cost estimates at €80.9m to 2030.	Methane	Short-term (EF) Medium-Long term (DI)
Total CO_2 equivalent reduction For measures 1 to 7 inclusive	1.53 - 2.18 MT CO_2 eq			
8 – Voluntary Diversification Scheme (removal of suckler cows and the development of other non-breeding beef or sheep enterprises and/or other farm enterprises).	Estimated 0.6 Mt CO_2 eq per 100,000 suckler cows (and followers) removed. *Note that this is an indicative calculation only, not a policy recommendation.	The indicative income foregone per suckler cow removed is estimated at €1,080 for farms exiting. * Note that this is an estimate only, not a recommendation. The level of public funding for any scheme would be a matter for further consideration.	All	Short term
9 – Voluntary Extensification Scheme (reduction in the number of suckler cows and the development of other non-breeding beef or sheep enterprises and/or other farm enterprises).	Estimated 0.6 Mt CO_2 eq per 100,000 suckler cows (and followers) removed *Note that this is an indicative calculation only,	The indicative income foregone per suckler cow removed is estimated at €1,350 for farms reducing. * Note that this is an estimate only, not a recommendation. The level of public funding for any scheme would be a matter for further consideration.	All	Short term

	not a policy recommendation.			
Measures 8 and 9 would provide additional reductions.	**Impact of Measure 8 & 9 depends on the level of participation in a voluntary scheme.**			

Enabling measures to support mitigation of Greenhouse Gas Emissions from the beef sector		
Measure	**Target GHG**	**Timeframe**
10 – Develop package of supports to incentivise the implementation of the measures set out in this report	All	Short-Medium term
11 – Establish robust methodologies for measuring and monitoring GHG emissions and removals at individual farm level.	All	Short-term
12 – Commission a study on a carbon farming framework.	All	Short-term
13 – Improve Nitrogen Use Efficiency – Liming and soil pH- Ensure 90- 100% of beef farms are soil testing for pH.	Nitrous Oxide	Short-term
14 – Encourage clover adoption and MSS. Ensure all farmers have incorporated clover/multispecies on 20% of their farm grassland by end of 2025.	Nitrous Oxide	Short-term
15 – Increase adoption of Low-Emissions Slurry Spreading (LESS)- target 80 - 90% adoption of LESS for all beef cow slurry manure by 2025.	Nitrous Oxide	Short-term
16 – Introduce Animal Health Measures listed in action 314 of the Climate Action Plan 2021.	Methane	Short-Medium term
17 – Develop Energy Diversification Opportunities.	All	Medium-Long term
18 – Design a Climate Action Communications Strategy.	All	Short-term
19 (a) Increase investment in climate change research and in Knowledge Transfer 19 (b) Establish an Agriculture and Climate Change Research Liaison Group.	All	Short-term
20 – Develop enhanced integration between the beef and dairy sectors.	All	Short-Medium term
21 – Support the role of young farmers and women in agriculture in implementation of the measures set out in this report.	All	Short-Medium term

A. DIRECT IMPACT MEASURES TO MITIGATE GREENHOUSE GAS EMISSIONS FROM THE BEEF SECTOR

1. Improving live weight performance for beef cattle resulting in earlier slaughter ages, reducing age of slaughter by between 2.7 and 3.9 months on average, from 2018 average of 26 months to 22-23 months on average by 2030.

Impact on Inventory – Enabling Factor/ Direct Impact:

Direct Impact

Teagasc research shows that improving live weight performance for beef cattle results in the abatement of circa 0.2 to 0.3 Mt CO_2e per head for each month slaughter age is reduced.

Recommendation

The Climate Action Plan 2021 target was to reduce average slaughter age of prime beef cattle by three months by 2030 relative to 2018. Teagasc research has subsequently indicated a somewhat lower reduction target of 2.7 months based on variations in breed, gender and month of slaughter. The average age of slaughter for prime cattle was 25.9 months in 2018 and therefore, this implies a slaughter age of 23.2 months in 2030. A higher ambition slaughter age reduction target of 3.9 months (slaughter age of 22.0 months) is also suggested where high levels of performance gains at farm level are achieved.

It is recommended to focus on improving lifetime animal live weight performance in order to achieve this target. In particular, early lifetime live weight performance is key. Enabling factors include excellent calf rearing practices, the use of high beef merit genetics, improved animal health and higher quality feed (forage/grazing). Live weight performance is a lifetime trait and therefore, setting targets at key time-points in the animal's life and frequent live weight performance data collection and monitoring through an extensive weight recording programme is key. Farm level data shows that increases in live weight performance is associated with improved profitability.

The target presented here is an average one for the sector and it is recognised that there will be differences in the level of live weight gain attainable depending on animal breed, farm, and farmer characteristics and furthermore, there is less scope for farms who already meet, or are close to, target live weight performance.

Key challenges

- Variances in suitability of different breeds/systems to realise gains in slaughter age reduction.
- The effectiveness of this measure is dependent on cattle numbers not increasing as a result of earlier finishing.

- The effectiveness of this measure is also dependent on earlier finishing not being achieved through increased use of concentrate feeding.
- Potential impact on the overall tonnage of meat processed.

Key impacts measured in specific CO_2e Mt reduction projections

Improving animal performance to facilitate a reduction in the average age at slaughter by 2.7 months by 2030 for relevant breeds and systems could deliver an estimated 0.57 Mt CO_2 eq by 2030. The higher ambition target of 3.9 months slaughter age reduction increases this to an estimated 0.82 Mt CO2e. Reductions arise from lower enteric and manure methane emissions. Given the lower quantity of manure produced, estimated reductions in nitrous oxide emissions are also included in these reduction projections. Further emissions reductions are also likely to arise from reductions in feed demand associated with earlier slaughter; these have not been included in this analysis.

Estimated Costs Costs here would centre around investment in genetic and feed technologies and weight recording.

Improving live weight performance of beef cattle, and associated reductions in slaughter age, is one of the key profit drivers for beef farms. However, there are costs involved in transitioning to higher efficiency production systems. Costs centre around investments in genetics, farm management and feed technologies. Equipment such as weight recording technology and greater analysis of soil nutrient status (to support better quality feed) and forage quality are also required.

Estimated emissions reductions through higher lifetime animal live weight performance and lower slaughter ages are **not** based on the increased use of concentrates feeding. In fact, higher levels of concentrate feeding are likely to offset much of the emissions reductions achieved through earlier slaughter.

At **current** levels of live weight performance, reducing slaughter age by 2.7 to 3.9 months are estimated to reduce carcass weight by between 10.5 to 17.2 kg per head. However, evidence has shown that slaughter age reductions do not necessarily lead to reductions in carcass weight with annual improvements in genetics and animal performance supporting similar or higher carcass weights at younger slaughter ages.

Key Contributing Factors (i.e., conditions or actions which could support the successful adoption and implementation of the measure.)

- Availability of appropriate incentives through supports/market return.
- Management programmes with frequent monitoring, live weight targets at key points in the animal's life and advisory service to support uptake of critical measures.

- Support for laboratory analysis of soil nutrient status and forage quality.
- Availability of appropriate knowledge transfer.
- Targeting appropriate specific systems/breeds.

Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies

3. Develop Methane Mitigating feed technologies

7. Develop Methane Mitigating Breeding technologies

16. Introduce Animal Health Measures listed in action 314 of the climate action plan 2021

Ag Climatise: Action 3: Genotype the entire national herd by 2030 to underpin the development of enhanced dairy and beef breeding programs that help achieve a reduction in our overall GHG output at a national level. Achieve targeted improvements in key metrics relating to age at slaughter and age at first calving for our national dairy and beef herds.

Climate Action plan: pg. 162 *Potential Metrics to Deliver Abatement in Agriculture*

Timeframe Short/Medium Term.

Responsibility DAFM/Farmers/Industry?Agency cross-collaboration.

2 – Reduce age at first calving of suckler beef cows by between 2.0 to 3.8 months compared to 2018.
Impact on Inventory – Enabling Factor/ Direct Impact: Direct Impact Teagasc research shows that reducing age at first calving from 36 to 24 months has the capacity to deliver a 0.6 t reduction in CO2 eq per cow unit in integrated calf to beef systems. The key enabling technologies are similar to those that facilitate earlier slaughter ages for beef cattle; in particular, higher daily live weight gains early in the animal's lifetime are critical. Farm level profitability also tends to be greater for 24 month calving systems owing to lower heifer-rearing costs.
Recommendation More suckler beef cows have their first calving at 22-26 months of age than at any other age interval. However, almost half of first calving heifers calve at greater than 30 months of age and average age at first calving is 30.2 months of age. Teagasc analysis has evaluated the potential to reduce age at first calving for suckler beef cows and have indicated a target reduction of 2.0 months compared to 2018. This implies an average age at first calving of 28.2 months. A higher ambition of 3.8 months (average age at first calving of 26.4 months) is also suggested where high levels of performance gains at farm level are achieved.
Key challenges • The potential mitigation from this measure is dependent on there being no increase in the overall cattle population • Variances in suitability of different breeds/systems to realise gains in calving age reduction, Teagasc will provide profile for further analysis.
Key impacts measured in specific CO_2e Mt reduction projections Reducing age at first calving by 2.0 months by 2030 could deliver an estimated 0.05 Mt CO_2 eq by 2030. The higher ambition target of 3.8 months reduction in age at first calving increases this to an estimated 0.10 Mt CO2e. Impacts are similar to those arising for earlier slaughter ages; reductions arise from lower enteric and manure methane emissions and lower manure nitrous oxide emissions. Further emissions reductions are also likely to arise from reductions in feed demand associated with earlier slaughter; these have not been included in this analysis.
Estimated Costs Reducing age at first calving has a positive effect on farm economics, particularly where replacements are sourced from within herds. However, as with earlier slaughter, there are costs involved in transitioning to higher efficiency production systems - investments in genetics, farm

management and feed technologies. Furthermore, achieving reductions by means of higher levels of concentrates feeding is likely to be counter-productive from an emissions perspective and is also likely to disimprove farm economics.
Key contributing Factors (i.e., conditions or actions which could support the successful adoption and implementation of the measure.) • Availability of appropriate incentives through supports/market return. • Management programmes with frequent monitoring, live weight targets at key points in the animal's life and advisory service to support uptake of critical measures. • Support for laboratory analysis of soil nutrient status and forage quality. • Availability of appropriate knowledge transfer. • Targeting appropriate specific systems/breeds**.**
Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies: 3. Develop Methane Mitigating feed technologies 7. Develop Methane Mitigating Breeding technologies 16. Introduce animal health measures listed in action 314 of the climate action plan. Ag Climatise: Action 3: Genotype the entire national herd by 2030 to underpin the development of enhanced dairy and beef breeding programs that help achieve a reduction in our overall GHG output at a national level. Achieve targeted improvements in key metrics relating to age at slaughter and age at first calving for our national dairy and beef herds.
Timeframe Short/Medium Term.
Responsibility DAFM/Farmers/Industry/Agency cross-collaboration.

3 - Development of methane-mitigating feed technologies

Impact on Inventory – Enabling Factor/ Direct Impact: Direct Impact

Research by Teagasc has shown the potential for feed additives to reduce enteric methane by approximately 30% in indoor systems.[1] Marketing of one specific additive with proven efficacy has recently been approved for dairy cows by the EU Commission following an assessment by the European Food Safety Authority. It is expected that approval for beef animals on indoor forage-based diets will follow. Research is ongoing for pasture-based settings in order to develop a slow-release bolus.

Given the requirement for a mechanism to deliver feed additives in grazing systems, slow-release prototypes are currently being developed and are being tested in New Zealand. It is hoped that this will become available in 2023/24. Similar research for Irish grazing systems will be tested in the coming years as part of the DAFM-funded Meth-Abate project.

Recommendation

Research in emerging feed additives and feeding methods must be accelerated and supported for Ireland's pastured-based system to ensure early adoption and provide the necessary evidence to include the potential mitigation in the national inventory.

Key challenges

- Research to date has shown that 3NOP will reduce enteric methane emissions by approximately 30% for confined systems of livestock production.
- Evidence-based published research of the efficacy of 3NOP for pasture-based use is a priority. Other halide-based compounds are showing significant early promise.
- Feed additives are likely to be costly, estimates are not yet available.
- Farmers are likely to require support to encourage adoption of this measure.

Key impacts measured in specific CO_2e Mt reduction projections

[1] Teagasc note on carbon budgets, 29 September 2021 (source: Teagasc note on carbon budgets_September_29_2021.pdf (climatecouncil.ie))

On the basis of using existing technology at the lower end of the range and adoption of newer technology at the upper end. An uptake rate of 25% of steers housed and 25% of heifers housed is estimated, (Suckler cows are not assumed to receive any additive) the total mitigation for beef animals is between 0.15 and 0.30 $MtCO_2eq$ in 2030.

Estimated costs

The cost per animal is €25.55 per head of cattle per year based on a price per kg of 3NOP that is assumed to be €80kg. Total estimated aggregate cost is €11.3m. If we were to include the new technology and assume that the efficacy increases to 20% with the new technology, and the uptake assumption is 25% of all non-dairy bovines (Just over 445,000 animals) then the mitigation from the beef system increases to 0.303 MtCO2 eq . The aggregate costs increase to €29m per annum.

Key Contributing Factors (i.e., conditions or actions which could support the successful adoption and implementation of the measure.)

- Co-ordinated cross-collaborative research efforts.
- This research needs to be developed further and peer reviewed, and it is not anticipated that it would contribute to a reduction in the inventory until the second carbon budget period.
- However, in anticipation of the availability of 3NOP, a discussion on costs and actions required for uptake of these technologies should be prioritised to ensure a maximum rate of adoption.
- Industry and advisory services will play a central role in the uptake of feed technologies in the sector.
- Immediate research is required to ensure that the technology is available to farmers and can be accounted for in the national inventory. Teagasc and DAFM will continue to support research of 3NOP.
- Capacity to absorb additional costs.

Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies

Climate Action Plan:
Action 313 - Progress the development of feed additives on methane emissions for use during the housing period.
Action 323 - Continue to invest in research to develop novel feed additives to reduce biogenic methane during the grazing season.
AgClimatise, Action 7 -Continue to invest in novel feed additives to reduce biogenic methane.
Food Vision 2030, Mission 1, Goal 1, Action 5 Ireland will play a leading role in shaping how greenhouse gas emissions from livestock farming are understood and addressed.
19.a) Increase investment in Climate Change Research and in Knowledge Transfer

19.b) Establish an Agriculture and Climate Change Research Liaison Group
Timeframe short/medium.
Responsibility DAFM/Agency/ Farmers/Industry cross-collaboration.

4 - Target a 90% replacement rate of CAN with Protected Urea by the end of 2025 for grass-based beef production systems

Impact on Inventory – Enabling Factor/ Direct Impact Direct Impact

Research shows that replacing Ammonium based fertiliser (CAN) with Protected Urea is a technology that can significantly reduce nitrous oxide (N_2O) emissions. The acceleration of the adoption of urea-based technologies to replace ammonium-based fertilisers is recommended.
Targets for this technology previously set out in Ag Climatise and Climate Action Plan 2021 with the ambition to have 65% of CAN use replaced with Protected Urea by 2030 (Cross sector target).

Recommendation

Recommendation is to accelerate uptake and target a 90% replacement rate of CAN with Protected Urea by the end of 2025 for grass-based beef production systems.

Key challenges:

- Availability of Protected Urea.
- Concern about variable efficacy on certain soil types.

Key impacts measured in specific CO_2e Mt reduction projections

Protected Urea has lower nitrous oxide (N_2O) emissions compared to CAN and lower ammonia (NH_3) losses compared to Urea. 90% replacement of CAN equates to an estimated saving of 0.2 MT CO_2eq to 2025.

Estimated costs

According to Teagasc estimates, Protected Urea is cheaper than CAN on a cost per kg of Nitrogen basis and while it may appear slightly more expensive than standard Urea, it provides the same “effective N” for the plant as Urea at a 12% lower spreading rate and is therefore cost neutral.

Table 1. below shows the price increase in fertiliser between January 2021 and January 2022 available to DAFM. For Protected Urea, an additional €50 should be added to the price).

Table 1. Fertiliser Prices January 2021 - January 2022

Product	January 2021 (€ per tonne)	December 2021 (€ per tonne)	January 2022 (€ per tonne)
CAN	220	690	690-700
Urea	320	990	890-920
27-2.5-5	320	810	810-820
18-6-12	320	750	750-760

Table 2. Estimated cost of spreading 50kg Nitrogen

Product	€ per tonne	kg N/Tonne	Atmosphere	Estimated Cost of the spreading 50kg N
CAN	€750	270kg N (27%)	3.79%	€139/ 50kg N spread
NBPT Protected Urea	€1000	460kg N (46%)	3.70%	€109/ 50kg N spread
Urea	€950	460kg N (46%)	15.75%	€118 / 57kg** N spread

**According to Teagasc, Urea must be applied at a 12% higher N rate because of the higher N losses associated with it.

Table 2 demonstrates that Protected Urea is cheaper than CAN on a cost per kg of nitrogen basis. While the cost per kg of nitrogen is cheapest for straight Urea when the extra losses associated with straight Urea are accounted for, Protected Urea is more beneficial and cost effective for the application of Nitrogen.

Key Contributing Factors (i.e., conditions or actions which could support the successful adoption and implementation of the measure).

• Support from industry for adoption • Two key factors to facilitate uptake include the availability of Protected Urea and the support of industry initiatives in cooperation with advisory services. • The establishment of the Fertiliser Database, which is planned to be operational in January 2023[15], will track fertiliser from import to end user. DAFM figure show that there was a 13.7% increase in the use of Protected Urea between 1st October 2020 to 31st March 2021 versus 1st October 2021 to 31st March 2022.
Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies Climate Action Plan, Action 307 - Increase the use of Protected Urea fertiliser. AgClimatise, Action 2 -Where chemical fertiliser is applied, promote the use of protected nitrogen products. 5. Reduce chemical Nitrogen use in the beef sector by 27%-30% by end of 2030, with a reduction of 22%-25% in the short term (2025). 19.a) Increase investment in Climate Change Research and in Knowledge Transfer 19.b) Establish an Agriculture and Climate Change Research Liaison Group
Timeframe: short term.
Responsibility: DAFM/Agency/ Farmers/Industry cross-collaboration.

[15] gov.ie - National Fertiliser Database (www.gov.ie)

5- Reduce chemical Nitrogen use in the beef sector by 27 - 30% by 2030, with interim target of 22 - 25% by 2025

Impact on Inventory – Enabling Factor/ Direct Impact: Direct Impact

Chemical nitrogen use directly impacts the inventory. Research to date has shown that nitrous oxide emissions (24.8% of agriculture emissions) can be significantly reduced by better land management practices, replacing CAN fertiliser with Protected Urea, replacing chemical fertiliser with legume fixed atmospheric nitrogen, the use of low crude protein diets and improvements in soil pH. There is a need to work to reinforce and sustain practices at farm level that will support the reduction in chemical nitrogen dependence through the reduced application of CAN fertilizer, while maintaining output and productivity.

Measures regarding nitrogen use can have co-benefits for both climate and water quality. The EPA's water quality in Ireland 2016-2021 report was published on 14 October 2022. Among the key messages arising from the report, the EPA is calling for urgent and targeted action to protect and restore water quality in the next River Basin Management Plan (2022-2027), and full implementation of, and compliance with, the Good Agricultural Practice Regulations.

Recommendation

Reduce chemical Nitrogen use in the beef sector by 27% - 30% by 2030, with interim target of 22 - 25% by 2025.
This is a reduction from approximate usage in 2018 by the Beef and Sheep Sector of 143k tonnes to 104k - 100k tonnes by end of 2030

Key challenges

- Diversity of system types.
- Limited supply of clover/cost of reseeding and capacity of extensive farmers to invest in reseeding which given the existing low levels of adoption in the beef sector will require significant investment from a sector with relatively low incomes.
- Extensive farms already applying very low levels of chemical N may find it challenging to reduce significantly.

Key impacts measured in specific CO_2e Mt reduction projections

For every 10,000 tonnes of chemical N removed, approximately 61,000 tonnes of CO_2 eq are abated. This equates to an estimated saving of 0.26 MT CO_2e to 2030.

The individual farm level impact is not estimated in this report and is dependent on individual farm circumstances and the measures that can be implemented to negate the effects of reduced chemical nitrogen use on-farm such as improving soil fertility, efficiencies, and refinements in farm management practices.

Estimated costs

The Teagasc Nitrogen Reduction Analysis (2020) reported that a 30% reduction in chemical nitrogen would reduce profitability per hectare by 15% in the dairy sector, assuming a linear reduction in profitability in a scenario where cow numbers are held constant, and the reduced grass production was made up by purchased feed. This study is now being updated to take account of the enabling measures available to maximise Nitrogen use efficiency which mitigate against this cost. A parallel exercise is required focussing on the beef sector

Stakeholder Comments

- The cost of fertiliser currently will facilitate the reduction in N use, alternatives such as providing support for reseeding with red clover should be explored, the cost for extensive systems is currently prohibitive.
- Other soil health factors should be considered.
- Variance in system types makes developing targets more complex than for other sectors and consideration should be taken of potential impact on productive capacity and unintended knock-on effects of capacity to achieve gains under animal performance measures.
- Consideration for potential leakage into other sectors is needed as well as the impact of fertiliser use for different systems e.g. grass growth for anaerobic digestion.

Key Contributing Factors (i.e., these are conditions or actions which could support the successful adoption and implementation of the measure).

- Availability of alternatives such as clover and supports for additional cost of reseeding.
- Availability of information on potential impact of reduction in usage on different system types on productive capacity.
- Cross impact of measures and consideration impact on ability to meet scheme targets needs to be clarified.

Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies

Action 304 of the climate action plan is to reduce chemical nitrogen use to an absolute maximum of 325,000 tonnes (annually) by 2030,

with an interim target of 350,000 tonnes by 2025. CAP Strategic Plan. Pillar I – Eco Scheme Agricultural Practice 3 – Limiting Chemical Nitrogen Usage. Food Vision 2030, Mission 1, Goal 3, Action 1- …transition the agricultural sector to a lower chemical nitrogen use system. 4. Target a 90% replacement rate of CAN with Protected Urea by the end of 2025 for grass-based beef production systems Food Vision Dairy Report: 2. Target a 100% replacement rate of CAN with Protected Urea by the end of 2025 for grass based dairy production systems 19. a) Increase investment in Climate Change Research and in Knowledge Transfer19. b) Establish an Agriculture and Climate Change Research Liaison Group 15. Increase the adoption of Low-Emissions Slurry Spreading (LESS). Target 80 – 90% adoption of LESS for all beef cow slurry manure by 2025. Food Vision Dairy report: 11. Increase the adoption of Low-Emissions Slurry Spreading (LESS). Target 90 – 10% adoption of LESS for all dairy cow slurry manure by 2025. 13. improve Nitrogen use efficiency – liming and soil pH. Ensure 90% - 100% of beef farms are soil testing for pH. Food Vision Dairy Report: 12. Improve Nitrogen Use Efficiency – Liming and soil pH- Ensure 100% of dairy farms are soil testing for pH 14. Encourage Clover Adoption and Multi-Species swards (MSS)- ensure all farmers have incorporated clover/multispecies on 20% of their farm grassland by end of 2025.
Timeframe: Short/medium term.
Responsibility: DAFM/Agency/ Farmers/Industry cross-collaboration.

6 – Increase Organic Beef Production to 180,000 ha by 2027
Impact on Inventory – Enabling Factor/ Direct Impact: Direct Impact Increasing the uptake of organic production will lead to a reduction in the volume of fertiliser used.
Recommendation Increase Organic Beef Production to 180,000 ha by 2027
Stakeholders Concerns Stakeholder concerns regarding the availability of organic markets to return the price premium required to maintain economic viability
Key impacts measured in specific CO_2e Mt reduction projections Achievement of targets in line with CSP and organics strategy of an increase of agricultural area under organic beef production to 180,000 Ha equates to an estimated saving of 0.2 MT CO_2e to 2030
Key Costs Funding of €37 million annually is allocated to the Organic farming scheme in the 2023 Cap Strategic Plan.
Key Contributing Factors (i.e., conditions or actions which could support the successful adoption and implementation of the measure). • Communicating the benefits of organic conversion to farmers. • Growing markets for organic produce. • The price point at which organic produce requires to be sold to maintain the income and profitability of the farm, further research is need on this point.
Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies. 5. Reduce Chemical N use in the beef sector by 27% - 30% by 2030, with interim target of 22% - 25% by 2025. 6. increase the area under organic beef production to 180,000ha by 2027 EU level targets set under the Farm to Fork and Biodiversity Strategies are for a 20% reduction in fertiliser use.
Timeframe: Medium-term.
Responsibility: DAFM/Agency/ Farmers/Industry cross-collaboration.

7.a) Develop methane mitigating Breeding Strategies (carbon sub-index)

b) Develop methane mitigating Breeding Strategies (building efficiency traits)

Impact on Inventory – Enabling Factor/ Direct Impact: Direct Impact

The first strategy can be considered an enabling factor as it is more linked to efficiency factors (i.e., in the short term).

The second strategy can be considered as having a direct impact and is expected to impact emissions in the medium to longer term.

Recommendation

7.a) Develop methane mitigating Breeding Strategies (carbon sub-index)

7.b) Develop methane mitigating Breeding Strategies (building efficiency traits)

Key challenges

- Efficiency gains from lower methane emitting animals via breeding can only achieve reductions win emissions where animal numbers are stabilising/reducing
- Research on breeding strategies must work to inform both breeding indices and the agriculture inventory (efficiency gained per unit)
- Funding costs of genotyping the herd - once off and ongoing – would be significant. Establishing the correct forum/approach to ensure equitable sharing of costs across all relevant beneficiaries will be key.

Key impacts measured in specific CO_2e Mt reduction projections

According to ICBF data, further developing methane reducing breeding strategies can provide an estimated saving of between 0.1 and 0.3 MT CO_2e to 2030.

According to Irish Cattle Breeding Federation (ICBF) data the following impact can potentially be expected from continuing to build on the work of programmes such as the Beef Data and Genomics Programme (BDGP) and the new Suckler Carbon Efficiency Programme as well as the development of the Dairy Beef Index in terms of delivering genetic improvement in addressing our ambitious national GHG mitigation requirements.

ICBF have estimated a mitigation potential from genetic improvement on beef of some 200 KT by 2030 and 400 KT by 2035. A further 1 MT (by 2030) is achievable through systems and management changes associated with an earlier finishing age.

A key aspect of the above work is to ensure that the above gains are captured in the national inventory models. Work is underway between ICBF, Teagasc and the EPA in this regard, with realised and projected genetic trends then being captured through annual changes in the Ym (methane efficiency) factors.

One of the significant benefits of the breeding strategy is that all participants ultimately receive the gain, albeit at different stages, depending on the participants use of technologies, such as genotyping, AI, sexed semen, and voluntary culling/replacements strategies. Methane mitigating breeding strategies also have co-benefits such as animal health and welfare. The tangible impact of methane mitigating breeding and feeding technologies on the inventory can only be measured over time and their impact on the inventory will need accurate scientific measurement. Hence a key part of the breeding strategy is around building accurate genotyping and phenotyping systems to measure and validate any gains at the commercial farm level.

The new carbon sub-index will become available for inclusion in the EBI towards the end of this year. It is expected that a similar carbon sub index will be incorporated into the beef indexes (i.e., replacement, terminal, and dairy beef) in 2023, with the potential inclusion of direct methane traits into these indexes thereafter (2024+).

Estimated costs

An estimate of €80.9, which works out at €10.1m/year over 8 years for a targeted programme. This cost is additional to the €260 million CSP suckler carbon efficiency measure in the CAP strategic plan which also targets productive efficiency gains through the improvement of genetic merit.

Key Contributing Factors (these are conditions or actions which could support the successful adoption and implementation of the measure.)

- Involvement of all livestock sectors.
- The adoption of the new carbon sub-index should be encouraged in tandem with the overall EBI. This should initially focus on reflecting the cost of carbon in the existing traits and then develop out into new traits such as the direct measurement of methane and earlier age at slaughter.
- Adoption/incentivisation level.
- Linkage through to dairy through proposed national genotyping strategy.

Cross cutting proposal linkages and alignment between the recommended measures in this report and relevant policies/strategies: 1 improving liveweight performance of beef cattle resulting in earlier slaughter ages. Reducing age of slaughter by between 2.8 and 3.9 months on average from 2018 average of 26 months to 22 -23 months on average by 2030. 2. reducing age at first calving for suckler beef cows by between 2.0 to 3.9 months compared to 2018 Climate Action Plan, Action 310: Increase focus on selection for traits that lead to lower methane production in the beef breeding programme. AgClimatise, Action 3: Genotype the entire national herd by 2030 to underpin the developments of enhanced dairy and beef breeding programs that help achieve a reduction in our overall GHG output at a national level.
Timeframe Short term (EF) medium to long term (DI).
Responsibility DAFM/Agency/industry/farmer cross collaboration.

8 – Voluntary Diversification Scheme

Impact on Inventory – Enabling Factor/ Direct Impact

Direct Impact

This scheme will only have a direct impact if structured in a way which ensures that reductions in breeding ruminants on a participating farm are not offset by increases in breeding ruminant numbers on that farm, or on other farms.

Recommendation

Consider the potential of an incentive scheme for farmers to voluntarily diversify their farming activity away from breeding ruminants for a minimum number of years. An incentivised voluntary diversification scheme that operates over a contract period should be considered. Under such a scheme, farmers would cease to have breeding ruminants in return for an appropriate incentive but may continue to operate other livestock or farm enterprises

The principles to be considered for such a scheme include:

- A voluntary scheme to allow farmers to completely destock breeding ruminants for a contract period.
- The scheme would operate over a contract period and provide an annual payment each year per breeding ruminants in line with stated and verified reductions.
- The farmer could not calve any breeding ruminants and register births on AIM.
- The benefit would be a reduction in breeding ruminants translating into a direct emissions impact.
- Legally the commitment would need to be linked to the herd and the holding, therefore a farmer could not opt for the scheme and remove all their breeding ruminants and then transfer the holding during the contract and for the transferee to start a breeding ruminant enterprise on that holding.
- The contract period and the link to herd/holding are essential elements to ensure that a reduction in emissions is achieved and lasts over a period of time.

- However, the farmer would be able to diversify into other areas of farming activity not involving breeding ruminants, conditions on land leasing will need to be considered. Some conditions on participation and activity may be imposed to avoid land abandonment.

In developing a detailed scheme, there would need to be extensive consultation with stakeholders to ensure that the scheme is well understood and effective, and that unintended consequences are avoided.

Key challenges

- Establishing the principles of such a scheme: the policy intent would be to reduce breeding ruminant numbers on participating farms, and subsequently in the overall national inventory. Therefore, the climate-positive effects of the scheme will not be realised if the land is merely recirculated within the breeding ruminant sector.
- Securing the level of public funding required to incentivise the adoption of the scheme.
- Complexity in attaching the reduction commitment to the herd and the holding over the contract period.
- Consideration of any unintended consequences must be part of the analysis before any scheme is introduced.
- Potential impact on intergenerational renewal and land use.
- Potential impacts on existing commonages requirements as well as requirements under CSP schemes.
- Potential impact of reduced throughput in the beef processing sector, including potential loss of markets, jobs and loss of processing efficiency.

Key impacts measured in specific CO_2e Mt reduction projections

Estimated 0.6 Mt CO_2 eq per 100,000 suckler cows (and followers) removed or 0.06 Mt CO_2 eq per 10,000 suckler cows (and followers) removed.

Estimated Costs

The indicative income foregone per suckler cow removed is estimated at €1,080 for farms exiting * Note that this is an estimate only, not a recommendation. The level of public funding for any scheme would be a matter for further consideration.

Stakeholder Comments Stakeholders expressed concern that the proposed exclusion of all breeding ruminants would exacerbate land abandonment, particularly on marginal land. This could have a negative knock-on effect on the economic and social sustainability of the relevant areas, particularly when the multiplier effect of cattle enterprises is considered. In response to Stakeholders comments, DAFM will explore the potential for ewes to be maintained on the land providing overall emissions are reduced. Stakeholders also expressed concerns about the potential economic and employment loss to other parts of the supply chain, including the processing sector.
Key Contributing Factors (i.e., these are conditions or actions which could support the successful adoption and implementation of the measure). • Identification of potential funding sources • Identification of diversification opportunities. • Appropriate scheme design
Cross cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 7. Develop methane mitigating breeding strategies 17. Develop energy diversification opportunities 20 - Develop enhanced integration between the beef and dairy sectors
Timeframe: Short-term
Responsibility: DAFM

9– Voluntary Extensification Scheme
Impact on Inventory – Enabling Factor/ Direct Impact **Direct Impact.** The scheme will only have a direct impact if structured in a way which ensures that reductions in breeding ruminants on a participating farm are not offset by increases in breeding ruminant numbers on that farm, or on other farms.
Recommendation Consider the potential of an incentive scheme for farmers to voluntarily extensify their livestock activity by reducing the numbers of breeding ruminants on their holding for a minimum number of years. It should be open to farmers under such a scheme to partially reduce their breeding ruminant numbers over a contract period in return for an appropriate incentive. The principles to be considered for such a scheme include: • A voluntary scheme to allow farmers to partially destock breeding ruminants for a contract period. • The farmer would commit to a specific reduction number via culling at commencement of the contract. • The scheme would operate over that contract period and provide an annual payment each year per breeding ruminants in line with stated and verified reductions. • Terms and conditions on restrictions regarding breeding ruminants would be set out in the Reduction Scheme agreement at the time of application. • The benefit would be a reduction in breeding ruminants translating into a direct emissions impact. • Legally the commitment would need to be linked to the herd and the holding, therefore a farmer could not opt for the scheme and remove all their breeding ruminants and then transfer the holding during the contract and for the transferee to start a breeding ruminant enterprise on that holding. • The contract period and the link to herd/holding are essential elements to ensure that a reduction in emissions is achieved and lasts over a period of time.

- However, the farmer would be able to diversify into other areas of farming activity not involving breeding ruminants, conditions on land leasing will need to be considered.
- In developing a detailed scheme, there would need to be extensive consultation with stakeholders to ensure that the scheme is well understood and effective, and that unintended consequences are avoided.

Key challenges

- Establishing the principles of such a scheme: the policy intent would be to reduce breeding ruminant numbers on participating farms, and subsequently in the overall national inventory. Therefore, the climate-positive effects of the scheme will not be realised if the land is merely recirculated within the breeding ruminant sector.
- Securing the level of public funding required to incentivise the adoption of the scheme
- Complexity in attaching the reduction commitment to the herd and the holding over the contract period.
- Consideration of any unintended consequences must be part of the analysis before any scheme is introduced.
- Potential impact on intergenerational renewal and land use.
- Potential impacts on existing commonages requirements as well as requirements under CSP schemes.
- Potential impact of reduced throughput in the beef processing sector, including potential loss of markets, jobs and loss of processing efficiency.

Key Impact measured in specific Mt CO_2e emission reduction

This proposal is for a voluntary measure that can have a direct impact on emissions by reducing breeding ruminants on participating farms. The choice to participate would be for the individual farmer to make based on individual circumstances.

Estimated 0.6 Mt CO_2 eq per 100,000 suckler cows (and followers) removed or 0.06 Mt CO_2 eq per 10,000 suckler cows (and followers) removed.

Estimated Costs The indicative income foregone per suckler cow removed is estimated at €1,350 for farms exiting * Note that this is an estimate only, not a recommendation. The level of public funding for any scheme would be a matter for further consideration
Stakeholder Comments Stakeholders expressed concern that the proposed exclusion of all breeding ruminants would exacerbate land abandonment, particularly on marginal land. This could have a negative knock-on effect on the economic and social sustainability of the relevant areas, particularly when the multiplier effect of cattle enterprises is considered. In response to Stakeholders comments, DAFM will explore the potential for ewes to be maintained on the land providing overall emissions are reduced. Stakeholders also expressed concerns about the potential economic and employment loss to other parts of the supply chain, including the processing sector.
Key Contributing Factors (i.e., these are conditions or actions which could support the successful adoption and implementation of the measure). • Identification of funding sources.
Cross cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 7. Develop methane mitigating breeding strategies 20 - Develop enhanced integration between the beef and dairy sectors
Timeframe Short-term.
Responsibility DAFM

B. ENABLING FACTORS TO SUPPORT THE MITIGATION OF GREENHOUSE GAS EMISSIONS FROM THE BEEF SECTOR

10 - Develop package of supports to incentivise the implementation of the measures set out in this report to improve the environmental sustainability of primary producers while also safeguarding economic viability

Recommendation

The development of appropriately funded and targeted supports aimed at incentivising the uptake of measures set out in the report. It is recognised that due to relatively low income and profitability levels in the beef sector, the capacity for capital investment on farm is limited, and the demographic profile of the sector also means that the uptake of new technologies and practices may be limited. While this is addressed in the current CSP through the various supports available to all farmers, it is recognised that there are additional challenges and costs regarding the adoption of innovations in the beef sector which require additional supports. The purpose of this report is to identify potential measures to contribute to the national emissions reductions targets and those set out for the sector. It is proposed that all of these measures are examined in more detail to determine the appropriate level of support required to incentivise optimal uptake.

Key Challenges

- Availability of funding in the context of existing pressures on the exchequer
- Structural issues in the sector which may constitute barriers to adoption of innovation

Key Contributing Factors

- The availability of adequate funding
- Ensuring a maintained awareness of existing capital investment supports

Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies

11. Establish robust methodologies for measuring and monitoring greenhouse gas emissions and removals at individual farm level.
Food Vision 2030, Mission 2, Goal 4 (various actions).
21. Support the role of young farmers and women in agriculture in implementation of the measures set out in this report

Timeframe Short- Medium term
Responsibility DAFM / Agency/Industry cross-collaboration

11 – Establish robust methodologies for measuring and monitoring GHG emissions and removals at individual farm level.

Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor

Recommendation

Information on greenhouse gas levels at the level of the farm that is compatible with the national inventory is required to inform appropriate policy making. This information is also essential to enable farmers to manage their carbon levels. Agencies such as Teagasc, ICBF and Bord Bia have access to considerable data relevant to this task. The Group are of the view that collaboration between agencies and farmers and potential for partnership with the private sector should be prioritised, with the aim of generating carbon measurements/ assessments for dairy farms over the next two years. The measurement and monitoring of GHG emissions and removals and sequestration merits a wider multi-sectoral approach as the initiative progresses and needs to also include the measurement and removals of emissions from LULUCF.

It is expected that a carbon calculator and decision-support tool will be developed as an integral part of the Signpost farm programme over the next two years, and in time this could be scaled up through the Origin Green programme.

Key Challenges

- While the EU Commission carbon farming proposals are currently limited to the LULUCF sector it will provide a framework for expanding to other greenhouse gases across Member States;
- EU operational examples are limited for farm level with only a few internationally.
- The large-scale deployment of measurement, reporting and verification process at farm level to take into account the individual conditions at farm and even field level.

Key impacts measured in specific CO2e Mt reduction projections

The recommendation commits to establishing a baseline of GHG emissions at farm level. By establishing a farm baseline, future options to reduce emissions will be enhanced. This measure is an enabling measure since it doesn't itself lead to any reduction in the inventory. The information created is

a necessary enabler of any future carbon trading scheme and Carbon Farming policy via production of knowledge and evidence of the impact of further mitigation action at farm level.

Emissions in the Agricultural inventory cannot be offset by sequestration actions provided by the Land Use, Land Use Change and Forestry (LULUCF) category.

The enabling framework to develop a carbon farming model, with the potential for trading, and which rewards farmers for emissions reductions and removals, including through potential private investment already underway under The Climate Action Plan 2021 and is led by DAFM and includes EPA, Teagasc, Bord Bia, , DECC, ISIF, with plans to finalise by Q4 2023.The Group are of the view that collaboration between agencies and sector stakeholders and potential for partnership with the private sector should be prioritised immediately, with the aim of generating carbon measurements for beef farms over the next two years.

The Teagasc Sustainability Digital Platform (under development in partnership with Bord Bia and the ICBF could be the tool to do this. It will need to be able to take account of all sequestration and energy contributions and will also need to be able to account for all enterprises on the farm. This partnership could be enhanced by drawing on relevant private sector expertise.

Resources

There will be set costs e.g., to set up a national calculator and annual operation costs to update the estimates at farm level as farmers mitigate through adopting technologies or reducing activity.

There is a requirement for additional on-farm advisory support to encourage farmers to incorporate these actions, as planned in an enhanced Signpost Advisory programme.

Key Contributing Factors

- Access to timely farm-level emissions data to aid the decision-making process at farm-level.
- Close coordination on development of data collection, protection and use approaches between all agencies and stakeholders to ensure synergies with all existing systems, particularly Bord Bia's Sustainable Beef and Lamb Assurance Scheme.
- Progress on carbon farming strategy and policy at the EU-level.
- Clear and appropriate communication at farm level

Cross-cutting Proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies Climate Action Plan, Action 322 -Develop an enabling framework to facilitate the roll out of a national carbon farming programme. Food Vision 2030, Mission 1 Goal 1 Action 4 - Roll out 'Carbon Farming'. 12. Commission a study on carbon trading framework 19 a. Increase investment in Climate Change Research and in Knowledge Transfer 19 b.establish an Agriculture and Climate Change Research Liaison Group 18. Design a Climate Action Communications Strategy
Timeframe Short term Finalise the development of an enabling carbon framework as set out in the Climate Action Plan 2021 by Q4 2023. It is expected that a carbon calculator and decision-support tool will be developed as an integral part of the Signpost farm programme over the next year and will provide a basis for measurement, reporting and verification at farm level. A working model for a dairy farm is being developed by Teagasc, with inclusion of other enterprises to follow. As part of the Signpost Programme's Advisory Campaign in 2021, Teagasc and Bord Bia collaborated on a campaign to encourage farmers to engage with climate action. The campaign focused on raising awareness among farmers of their Carbon Footprint through the Farmer Feedback Report and engaging with a Teagasc advisor for decision-making on-farm. The "Know Your Carbon Footprint" campaign under Teagasc's Signpost Programme is underway and will include farmer participation, media partnership, direct communications via text and newsletter, webinars, discussion groups and advisor training
Responsibility DAFM/Agency cross-collaboration

12– Commission a study on a carbon farming framework

Impact on Inventory – Enabling Factor/ Direct Impact: Enabling

Recommendation

A comprehensive study should be undertaken to explore the potential of developing a carbon farming framework for methane and nitrous oxide emissions that would be suitable in an Irish context. There are a number of options identified in international research for the implementation of carbon farming, including state incentivisation for the reduction of carbon, state managed carbon trading arrangements, 'cap and trade', and various private sector initiatives.

The European Commission has also committed to the development of a carbon farming framework, although the emphasis in this work to date has been limited to the land use, land use change and forestry (LULUCF) sector. The Group proposes reviewing the relevant literature and establishing an understanding of the challenges of implementation and the economic and social implications for dairy and the wider agriculture sector of such a framework. In an Irish context, particular attention should be paid to the emissions from livestock agriculture while recognising that a comprehensive carbon trading model would also need to include LULUCF emissions/savings as well as the contribution to energy and is dependent on the availability of verifiable farm-level emissions data.

Stakeholder Comments

A number of stakeholders represented on the Group raised concerns about the potential for particular types of trading arrangements, such as a Cap-and-Trade model to result in a *de facto* restriction on cow numbers and/or production. They were also concerned that carbon credits could leak from Agriculture to other sectors. Agreement to the commissioning of detailed research/exploring the potential of carbon farming framework should not be interpreted as agreement to any particular model, but a review of best international practice to identify what model of carbon farming might best suit the Irish beef sector.

Further stakeholder comments included that a framework needs to ensure that carbon rights from agriculture are fully retained and ring fenced for the agri-sector as a whole. The early adopters of climate efficiency measures must be recognised in the event of a future carbon farming arrangement.

Representatives expressed reservations about researching a measure which may have implications for other agricultural sectors. Concern was expressed that the study is restricted to methane and nitrous oxide emissions, and that the study should also take account of removals.

Key Challenges

• Implementation of a carbon farming model and a trading system, in particular would be likely to require a detailed administrative framework to facilitate carbon farming, involving the robust measurement of total GHG emissions at individual farm level , the assignment of rights and the creation of a trading system, while recognising that a comprehensive carbon model, including LULUCF, depends on further development of an EU model of 'carbon farming', in which it is envisaged that every farmer should have access to verifiable emissions and removal data.

• EU Commission carbon farming proposals are currently limited to the LULUCF sector and at present there are few examples of operational models in the EU (for example Label Las Carbonne) and only a few exist internationally.

Key impacts measured in specific CO_2e Mt reduction projections

This proposal is for a study to explore the potential of a carbon farming framework with the objective of reducing total emissions associated with the beef sector.

This recommendation should be driven through the interdepartmental working group chaired by DAFM which is already tasked to deliver an enabling carbon farming framework under the Climate Action Plan process.

Estimated costs

The cost of the study recommended in this measure have not been determined as part of this report.

Providing a cost for a carbon farming model has yet to be carried out in an Irish context. How a carbon farming schemes should be administered is another requirement of a study. From an administrative viewpoint, a carbon farming mechanism requires farm- or processor-level data to monitor, report and verify emissions (i.e., transaction costs) which could be substantial at the outset; however, such costs could reduce over time as systems are established, technologies improve and those involved learn and become more familiar with the processes. Each farm would need to know their total annual net emissions. Such a model could entail potentially very significant administrative costs for DAFM and partners in establishing and operating such a mechanism.

Key Contributing Factors

• This recommendation should be considered within the context of the Climate Action Plan commitment of developing an Enabling Carbon Framework which is being guided by an interdepartmental Working Group, chaired by DAFM.

• Consultation with beef sector stakeholders on the scope and findings of this study is recommended to ensure that all relevant considerations are covered.

Cross-cutting Proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies

AgClimatise, *Action 17* Develop a pilot scheme in relation to on-farm carbon trading to reward farmers for the public goods they are providing

11. Establish robust methodologies for measuring and monitoring greenhouse gas emissions and removals at individual farm level

19a Increase investment in Climate Change Research and in Knowledge Transfer

19 b establish an Agriculture and Climate Change Research Liaison Group

Timeframe Short-Medium term
Responsibility DAFM/Agency cross-collaboration

13 – Improve Nitrogen Use Efficiency – Liming and soil pH- Ensure 90 – 100% of beef farms are soil testing for pH
Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor
Recommendation Liming plays an important role in improving soil fertility for better grass growth and is considered by the Group to be a crucial enabling measure to support the reduction of chemical N. Lime use is assumed to reach 2m tonnes usage by 2030 in the MACC with progress from current use of less than 1.345m tonnes occurring in a linear fashion between 2022 and 2030. It should be noted that liming does create a small increase in direct CO_2 emissions, but in the context of overall GHG balance, this is not considered important. Additional measures/supports on soil pH and liming element should be considered to support the upcoming Fertiliser Database ambitions.
Key Challenge To ensure the majority of beef farms are approaching optimum soil pH to ensure maximum nutrient use efficiency
Resources Soil Sampling and Appropriate Liming is considered an eligible practice for a farmer to receive the Eco-Scheme Payment detailed in the CAP Strategic Plan 2023-2027. Support is based on an annual payment for all eligible hectares covered by the commitments, i.e. farmers will receive payment on all eligible hectares on their holding. Payments will be made on additional costs incurred and income foregone as set out in the EU Regulations under Article 31 (7) (b) of the CAP Strategic Plan Regulation. An expected 129,000 eligible farmers could participate in the scheme, and the payment per hectare will be impacted by the actual participation rate. As an indicative figure only, if 85% of the eligible hectares currently claimed by farmers participate in the scheme successfully and assuming all hectares receive the same payment rate, the payment rate would be approximately €77 per hectare. Based on a ring fencing for Eco-Schemes of 25% of the Direct Payments ceiling, the annual indicative financial allocation for this intervention is estimated at approximately €297 million per annum, amounting to a total indicative financial allocation of approximately €1.485 billion for the period 2023-2027. [20]
Key Contributing Factors Time and investment required

Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 5. Reduce chemical Nitrogen use in the beef sector by 27% - 30% by end of 2030, with interim target of 22% - 25% by (2025).
Timeframe Short-Term
Responsibility DAFM / Agency/Industry cross-collaboration

14 - Encourage clover adoption and MSS. Ensure all farmers have incorporated clover/multispecies on 20% of their farm grassland by end of 2025.

Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor –

Supports efficient use of fertiliser through compensation of reduced chemical N.

Recommendation

Encourage clover adoption and MSS. Ensure all farmers have incorporated clover/multispecies on 20% of their farm grassland by end of 2025.

The increased incorporation of clover in grass swards provides an immediate opportunity to reduce in fertiliser use, especially now that price of fertilisers has increased substantially, and there is an opportunity to make progress on this immediately to enable reduced chemical nitrogen use. It is an enabling measure in the Teagasc MACC and MACC analysis has assumed an uptake of 15% on beef farms in reseeded land between 2021 and 2030. However, a more ambitious uptake is required and recommended. The Group recommends that all dairy farmers should incorporate clover/multispecies swards on 20% of their farm grasslands by the end of 2025.

The adoption of clover is considered a critical enabling measure by the Group and industry has already moved towards this goal. There was €1 million funding for the multi-species sward measure available to farmers in the 2022 season to support the establishment of approximately 8000 ha of the crop.

Measures involving the adoption of MSS should be accelerated and supported by industry. Red clover and white clover are both advantageous and science supports the benefits of adoption. Further research is required; however, the widespread adoption of these technologies should be recommended. Further work on the effects of grazing management of Clover and Multi species sward on enteric fermentation is also required.

Key Challenges

- Encouraging adoption through intensive advice
- Sourcing seed and clover safe sprays

Resources

There was €1 million DAFM funding for the multi-species sward measure available to farmers in the 2022 season.[21]
Sowing of a Multi Species Sward, on at least 7% of the farmers eligible area in the year s/he selects this is considered an eligible practice for a farmer to receive the Eco-Scheme Payment detailed in the CAP Strategic Plan 2023-2027.

Support is based on an annual payment for all eligible hectares covered by the commitments, i.e. farmers will receive payment on all eligible hectares on their holding. Payments will be made on additional costs incurred and income foregone as set out in the EU Regulations under Article 31 (7) (b) of the CAP Strategic Plan Regulation. An expected 129,000 eligible farmers could participate in the scheme, and the payment per hectare will be impacted by the actual participation rate. As an indicative figure only, if 85% of the eligible hectares currently claimed by farmers participate in the scheme successfully and assuming all hectares receive the same payment rate, the payment rate would be approximately €77 per hectare. [22]
Key Contributing Factors Investment in Research and Knowledge Transfer
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 5. Reduce chemical Nitrogen use in the beef sector by 27% - 30% by end of 2030, with interim target of 22% - 25% by (2025). 18. Develop a Climate Action Communications Strategy
Timeframe Short term
Responsibility DAFM / Agency/Industry cross-collaboration

15 – Increased adoption of Low-Emissions Slurry Spreading (LESS)- target 80% - 90% adoption of LESS for all beef cow slurry manure by 2025

Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor.

Direct impact on Ammonia emissions & enabling factor in mitigation of N_2O.

Recommendation

Increased adoption of Low-Emissions Slurry Spreading (LESS)- target 80% - 90% adoption of LESS for all beef cow slurry manure by 2025.

LESS technologies result in better recovery of Nitrogen during the application of organic manures. Ag Climatise sets a target of 60% of all slurry spread by LESS by 2022, 80% by 2025 and 90% by 2027. Teagasc NFS data show that 36% of slurry was spread with LESS in 2020 and this is already reflected in the EPA inventory as NH3. Investment in LESS is expensive for farmers. Time and significant investment are needed to maximise its adoption. Farmers have shown a willingness to embrace this technology and adoption is increasing.

This momentum needs to be maintained and should be encouraged and incentivised through appropriate industry and state support. Information sharing to ensure widespread adoption is required.

Protected urea should become the nitrogen fertiliser of choice for grass-based livestock production, essentially leaving CAN as a tillage sector input.

Key Challenges

- Adoption and support; physical constraints, such as machine availability should be addressed to ensure continued progress.
- LESS equipment is more difficult when soil trafficability is poor. In turn, this will necessitate greater support and investment in slurry storage to ensure a greater buffer when soil and weather conditions are unsuitable for land-spreading.
- The range provides for land types that are unsuitable for LESS equipment.

Resources

LESS is prioritised for investment in the CAP Strategic Plan 2023-2027. The scheme will include support at 40% grant rate for with a higher investment rate of 60% offered to young farmers and women farmers to support generational renewal and gender balance. Investment ceilings will be increased to €90,000 with separate ceiling for LESS equipment. As this scheme is demand-led, the annual indicative financial allocation for this intervention varies year on year, dependent on the number of projects receiving funding. The total indicative financial allocation for this intervention is €100m. The first three years of the programming period is primarily financed via the Rural Development Programme 2014-2025. Investments for women farmers will be funded from CSP from 2023. A total of €440m will be made available under On-farm investments over the period 2021-2027, of which €340m will be funded from the Rural Development Programme in the period 2021-2025.

Key Contributing Factors Grant availability.
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 5. Reduce chemical Nitrogen use in the beef sector by 27% - 30% by end of 2030, with interim target of 22% - 25% by (2025).
Timeframe Short-term
Responsibility DAFM / Agency/Industry cross-collaboration

16 – Introduce Animal Health Measures listed in action 314 of the climate action plan 2021
Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor
Recommendation Introduce animal health measures listed in Action 314 of the Climate Action Plan 2021. This recommendation lists a series of measures addressing both regulated and non-regulated conditions, including BVD, TB, antiparasitic resistance, Johne's disease, clinical and sub-clinical mastitis, IBR and general livestock health and welfare (with an initial focus on calves). Improved animal health is also an essential support measure in the reduction of antibiotic use on farms.
Key Challenges • Obtaining EU approval for national BVD eradication programme as a precursor to applying for freedom; management of subsequent transition to post-eradication surveillance. Progression of BVD eradication programme. • Industry-wide agreement required for a national IBR programme, with associated legislative support. • Promotion of Parasite Control TASAH in 2022 to maximise engagement. • Promotion of registration in the Irish Johne's Control Programme.
Key Contributing Factors • AHI convenes cross-industry Implementation Groups on BVD, Johne's disease and IBR. • Significant work modelling options for a national IBR programme has been carried out by AHI, and there is already a significant level of vaccine usage (more than 3 million doses sold annually). • DAFM has convened a TB Forum and 3 associated Working Groups to progress control of TB. • ICBF has extensive experience in managing data from national animal health programmes, developing dashboards for farmers and service providers to present results, and using these to contribute to improving genetics related to animal health.
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 1. Improving live weight performance for beef cattle resulting in earlier slaughter ages

Action 5 of the AgClimatise report, Further enhance animal health strategies to support climate ambitions and environmental sustainability through promotion of sustainable animal health and welfare practices and enhancing food safety and authenticity The National Farmed Animal Health Strategy.
Timeframe Short to Medium term
Responsibility DAFM/AHI/Agencies/Industry. Input from a wide range of other stakeholders, including farming and veterinary organisations, processors, ICBF, Teagasc and UCD.

17 – Develop Energy Diversification Opportunities

Impact on Inventory – Enabling Factor/ Direct Impact:

Enabling Factor

Enabling at farm level and Direct Impact across all national CO_2 reduction targets

A range of viable energy diversification options are emerging that can be deployed at farm level. Micro-Generation electricity technologies on farms such as rooftop solar, Photovoltaic (PV) and wind turbines should be promoted. Carbon-mitigation benefits of these energy diversification technologies are attributed to the energy sector budget and not the agriculture sector and thus are not directly relevant to this report but should be considered as part of a Whole of Government response to energy diversification.

Biomethane production via Anaerobic Digestion (AD) has the potential to be a key option to decarbonise heat/thermal demand within dairy processing. There is potential to have an impact on the Agricultural inventory. For example, there have been multiple business cases put forward by the Project Clover industry group

Sustainable biomethane production can form an important part of the basis of a national biomethane strategy
However, direct benefits to the agriculture inventory can only accrue where agricultural land currently supporting ruminants is used as gross feedstocks for AD instead. There are also possibilities to enable reducing emissions by using AD digestate as fertiliser and act as substitutes for traditional chemical fertilisers.

Electricity and/or heat feed-in tariffs need to be more favourable for small-scale anaerobic digestion, but interest in such technologies is increasing in the current climate of rising input costs.

Recommendations

- Biomethane production should be considered a potentially important diversification option given rising input costs.
- Carbon Farming using a farmer-centric approach presents opportunities for diversification of farm enterprises; and supported uptake of these opportunities for farmers is recommended.
- The Group recommends that an integrated business case for sustainable biomethane production as the basis of a national biomethane strategy should be developed based on a private sector Carbon Farming initiative.
- Consider the potential to deliver a long-term roadmap for an indigenous biomethane industry based on sustainable feedstocks.

Resources DAFM currently provides grant aid through the TAMS scheme to assist farmers with solar investments. The grant aid under TAMS is available at the standard rate of 40%, with a higher grant rate of 60% available to qualified young farmers. It is proposed that support for renewable energy investments will continue under the new Capital Investment Scheme as part of the CAP Strategic Plan. Renewable energy generation is also a measure provided for by the Sustainability Action Payment programme.
Key Contributing Factors • Climate Action Plan 2021 recognises the key role of energy diversification such as biomethane, PV and wind to decarbonise sectors of the economy. Whole of Government response required • Capacity to invest in relevant technologies at farm level • Addressing planning, marketing and finance issues are key for success. • REPowerEU – leverage on EU strategy and policy for energy security, storage, and energy pricing. • Teagasc will commission it's Biomethane Pilot Demonstration Plant.
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 8. Voluntary diversification scheme. 9. Voluntary extensification Scheme
Timeframe Medium to Long-term
Responsibility DAFM/Agency/ Department of Climate Action/Energy and SEAI/ Farm org/cross collaboration

18 – Design a Climate Action Communications Strategy
Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor
Recommendation: Develop targeted communications strategy to develop an increased awareness in the agriculture sector of obligations in respect of the specific agriculture target of 25%; highlighting farm-level actions which directly impact the agriculture inventory; to include farm efficiency education programme aimed at improving herd efficiency and performance, with income, labour efficiency, farmer well-being and farm safety as core KPIs and to identify opportunities for diversification.
Purpose • Ensure that responsibilities under the Climate Action Plan are understood. • Scope of the agriculture inventory and the associated distinction between direct actions and enabling actions must be communicated to farmers and wider agri-food stakeholders in all sectors to empower them to take actions on their farms that directly affect the agriculture inventory, while recognizing the value of enabling actions to support the adoption of these direct measures and that also improve biodiversity and water quality. • The processing sector has a key responsibility to ensure that there is consistency in messaging on climate change and sustainability. • Communicate to the farming community and the general public on what farmers are currently doing to ensure positive climate actions are recognised and highlighted. • Communication to the public that there is a cost associated with sustainability and food prices need to reflect these costs.
Key Challenges • Defining production as an economic activity to inform agriculture inventory. • Economies of scale and current structure of the sector which limits ability to support the bioeconomy including carbon farming
Resources Adapt existing communication strategies to promote the measures proposed by this report. Bord Bia, Teagasc and Industry to fund.
Key Contributing Factors • Establishment and contribution of Teagasc Centre of Excellence in Agri-Food and Climate Change • Industry support in messaging.

• Ongoing development of existing metrics by Bord Bia, Teagasc, ICBF to communicate farm carbon footprint including GHG emissions and nutrient management planning to farmers through accurate and timely communication. • Building on Teagasc/Bord Bia collaboration on communications based on the Signpost programme. • Development of common messaging /comms strategy on climate change/sustainability best practice on a broader whole of government /whole of sector basis.
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies Relevant to effective implementation of all measures.
Timeframe Short term
Responsibility DAFM/Agency/ Farm org/cross collaboration

19 –(a) Increase investment in climate change research and Knowledge Transfer **(b) Establish an Agriculture and Climate Change Research Liaison Group**
Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor leading to the identification and adoption of new mitigation technologies.
Recommendation 1. Examine the most cost-effective means of significantly increasing investment on Research and Knowledge Transfer on Climate Change and related matters. Input from private organisations undertaking research should also be considered. 2. Establish an ACCRLG to review all national and international research on agriculture GHG emissions and to ensure that information is communicated in a timely manner to the EPA to enable the most rapid incorporation that is possible of new scientific information into the inventory of Greenhouse Gases. The ACCRLG should foster cross-agency and academia-based, coordination, collaboration, and research ambition in key identified areas and should include a farmer and an industry representative. The ACCRLG should foster cross agency and academia based, coordination, collaboration and research ambition in key identified areas and should include a farmer and an industry representative.
Key Challenges • Requirement for robust scientific evidence and peer reviewed publications. • Research needs to capture positive practices at farm-level. • Identifying the funding required for enhanced Research and KT investment in climate change and related matters. • Continuation of joined up approach on sustainability and climate change from a whole of Government/whole of sector basis post- Food Vision Beef and Sheep Group.
Resources DAFM is committed to increasing its spending on climate related research by 40% in the period 2021-2025 (compared to a base in 2020). The level of investment in climate related research and knowledge transfer may need further examination in the context of facilitating the direct measures detailed in this report.

Key Contributing Factors • Ongoing liaison with the Agriculture and Land Use Inventory Refinement, Projections, Policies and Measures Group to ensure that future studies conducted, and measurements taken within those studies, are not duplicated, can be collated, and will meet the EPA's requirements (number of projects, sites, and measurements) for inclusion in the national inventory calculations. • Establishment and contribution of Teagasc National Agricultural Sustainability Research and Innovation Centre (NASRIC)
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies Relevant to all proposed N_2O and CH_4 measures.
Timeframe Short-term
Responsibility DAFM/Agencies/Academia

20 – Develop enhanced integration between the beef and dairy sectors

Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor

Develop mechanisms to enhance the integration between the dairy and beef sectors with a view to the following benefits.

Develop mechanisms to enhance the integration between the dairy and beef sectors.
Existing measures such as the Dairy Beef Calf Programme and Teagasc's Dairybeef500 programme support sustainable dairy beef production. Current research and direction in breeding strategies is also targeted at improving the quality of beef from the dairy herd without impacting on reproductive performance. With over half of beef produced now coming from the dairy herd, a strategic direction for better integration of the herds should continue to build on current schemes and ongoing research at Teagasc and ICBF.

Building on these schemes to support integration between beef and dairy systems can be used to further sustainability goals and will also have a positive impact on the welfare of male dairy calves. Potential areas for development include enhanced use of high DBI sires in the dairy herd, enhanced use of sexed semen and targeted support to farmers rearing calves from the dairy herd.

The recent EFSA opinion and recommendations on cattle transport, and in particular the transport of un-weaned calves, may have a significant effect on future calf export potential. A successful dairy beef strategy will improve the resilience of the sector to potential shocks, with additional benefits for calf health and welfare.

Key Challenges

- Profitability challenges associated with rearing calves from the dairy herd
- Appropriate engagement between the beef and dairy sectors
- Requirements for dedicated facilities to facilitate dairy beef enterprises on farm.
- Knowledge transfer, training and upskilling of participants.

Resources

The Dairy Beef Calf Programme is currently funded by the Irish exchequer.

Key Contributing Factors

Knowledge transfer and advisory service

Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies

7 a) Develop methane mitigating Breeding Strategies (carbon sub-index)
7 b) Develop methane mitigating Breeding Strategies (building efficiency traits)
18. Design a Climate Action Communications Strategy

Timeframe
Short term
Responsibility
DAFM/ICBF/Agencies/Industry cross collaboration

21 – Support the role of young farmers and women in agriculture in implementation of the measures set out in this report

Impact on Inventory – Enabling Factor/ Direct Impact: Enabling Factor

Recommendation

Food Vision 2030 recognises that Generational Renewal and Gender Balance are critically important to ensuring the sustainability of primary producers under Goal 4 of Mission 2. This Group recognises that young farmers and women in agriculture bring new skills and new thinking to the farm enterprise, and will be key enablers of the adoption of new technologies and efficiency measures to reduce emissions on beef farms. Both groups require support to fully enable them to drive the change required for the full suite of measures set out in this Report.

The Group recommends that a study be undertaken on the role young farmers and women can play in implementing the measures set out in this Report, ensuring that succession planning, generational renewal and gender equality are supported as policy priorities.

Key Challenges

• The current average age of a beef farmer is 59 in the 2020 Census of Agriculture; and the overall share of all farm holders aged under 45 fell from 35% to 21% between the 2000 and 2020 Censuses of Agriculture[23].

• The 2020 Census of Agriculture recorded that 27% of those working on farms were women, but that they represent 13.4% of farm holders[24]; further, approximately half of female farm owners are aged over 60 according to DAFM's client database[25].

Resources

Significant supports will be provided for women and young farmers under the CSP for 2023:

• Complementary Income Support for Young Farmers (CIS-YF) – which will build on support available under the Young Farmers Scheme from 2015 to 2022 – will provide payments, to appropriately qualified farmers under the age of 40, in the years immediately following the young farmer setting up as head of a holding. Payments are available for up to five years under the intervention, up to a maximum of 50 hectares., with payments expected to fluctuate but average approx. €178/ha across the 2023-27 CAP period. 26 This is a significant rate increase over the similar scheme in the current CAP period (€68 approx.).

The Young Farmers' Capital Investment Scheme provides financial help to young farmers to upgrade their agricultural buildings and equipment. It helps them to meet the capital costs associated with the establishment of their enterprises. Grant aid is paid at 60% up to a maximum of €80,000 per holding.27

• The On-Farm Capital Investment Scheme will make enhanced grant aid for investment available to Young Farmers and Women Farmers, at 60% rather than the standard rate of 40%, to support Generational Renewal and Gender Balance.

• A tax credit is available at national level, of €25,000 over five years, to assist with the transfer of farms within Succession Farm Partnerships, promoting and supporting the earlier intergenerational transfer of family farms. • The CAP Strategic Plan 2023-27 contains a Collaborative Farming Grant. This intervention provides support of up to €1,500, based on 50% of vouched costs, for each of the following: (a) the establishment of farm partnerships and (b) advice costs for an older farmer to assist in succession/retirement planning. • A European Innovation Partnership call for proposals to incentivise generational renewal through succession/partnership arrangements in agriculture. • Measures in the CAP Strategic Plan 2023-27 have been developed with a gender-aware perspective, and Objective Eight (Vibrant Rural Areas) includes the promotion of gender equality. The new CAP will include the possibility for women-only Knowledge Transfer groups; a European Innovation Partnerships call for proposals to incentivise women's participation in agriculture; improved recording, collection and reporting on gender data across all CAP schemes; and the National CAP Network will be leveraged to increase the involvement of all women in the implementation of the CAP.[29] A number of agri-taxation measures are in place to facilitate land mobility and intergenerational transfer.
Key Contributing Factors • CSP Supports for young farmers and women in agriculture • Implementation of Food Vision actions to support young farmers and women in agriculture
Cross-cutting proposal, linkages and alignment between the recommended measures in this report and relevant policies/strategies 11. Establish robust methodologies for measuring and monitoring greenhouse gas emissions and removals at individual farm level. Food Vision 2030, Mission 2, Goal 4 (various actions).
Timeframe Short- Medium term
Responsibility DAFM and all Industry stakeholders

7. Conclusion

The Irish Government is committed to becoming carbon-neutral by 2050 and operating an economy with net-zero greenhouse gas emissions. This national strategic objective to be climate neutral by 2050 is set out in the Climate Act 2021. The transition to a climate-neutral society is both an urgent challenge and an opportunity to build a better future for all. All parts of society and all economic sectors are expected to play a role – from the power sector to industry, transport buildings, agriculture and forestry.

The Government has determined that the agriculture sector must reduce its GHG emissions by 5.75Mt CO2 eq. by the end of 2030. This report sets out measures which could enable the beef sector to contribute to this demanding target.

The membership of the Food Vision Beef and Sheep Group accepts the overarching need for the beef sector to contribute to the challenging emissions reduction target set for the agricultural sector, as well as meeting the demands of the marketplace, and maintaining the economic viability of our farm family model.

This Report has been prepared through a process of collaboration and cooperation. The measures set out in Section 5 of the Report were discussed in detail among the Group. Not all measures received unanimous agreement, with significant reservations expressed from both farming organisations and the industry in relation to the financial impact of some of the measures and the wider economic impact on the viability of the sector of specific measures.

From the outset of its deliberations, the Group considered it essential to clarify how different actions contributed directly (e.g., reductions in chemical N and in methane) towards a reduction in the national inventory of greenhouse gases versus actions that enabled this reduction to be brought about (such as, the use of clover, LESS etc). The Group is also of the view that this critical distinction needs to be prominent in all communications with farmers on how emissions can be reduced and in the design of incentivisation measures to encourage behavioural change among farmers.

Similarly, the Report is framed around direct impact and enabling measures. The first seven measures presented in the Report are direct impact measures. Two of these, specifically focused on the need to reduce nitrous oxide emissions, will mean reductions in chemical nitrogen usage on farms, and a rapid shift to Protected Urea. A further four are directly focused in reducing methane through a combination of changing management practices, breeding and adoption of methane mitigating feed technologies. The prospects for the use of emissions inhibiting feed additives, and in particular 3NOP which is under research at Teagasc are very positive. Breeding Strategies can also play an important role in addressing the methane fraction of emissions. The final of these seven measures, increasing organic beef production, is aimed at both methane and nitrous oxide and is already receiving significant financial support to enable the transition at farm level under the CAP Strategic Plan.

This Report estimates that based on these seven direct impact measures that the beef sector can contribute between 1.53 – 2.18 Mt of CO2 eq reduction to the overall target. This range is of course dependent on a number of assumptions concerning the take up of these measures.

Measure 8 and 9 detailed in this Report refer to a Voluntary Diversification Scheme and a Voluntary Extensification Scheme, both of which could deliver direct reductions in methane, but this would be dependent on timing and take-up of a voluntary scheme and would need to be carefully designed and managed to avoid unforeseen consequences. In the Group's deliberations these measures were the most contentious and it proved difficult to achieve any level of consensus. Concerns expressed included the economic and social impact, across all elements of the supply chain, of removing animals. It was noted that a critical mass, in terms of output, is needed for a viable beef industry which can in turn provide adequate returns to farmers and concerns were expressed about any measure which would threaten this viability. There were also concerns that any restrictions on land use and mobility would adversely affect intergenerational renewal. Group members also felt that they could not support, at this stage, such measures without seeing the greater detail. The Group recognises, that all the proposed measures will require further refinement in terms of design and estimated cost and impact.

The remaining measures are enabling measures which while not providing a direct impact are equally important in supporting and enabling the reductions to be achieved through the direct impact measures. In total there are 21 recommended measures in this Report, set out in the form of outline measures. Some will require considerable additional effort to design robust and effective policy

interventions. Group members emphasised the need for continued consultation with a view to the further development and successful implementation of the proposed measures.

The Group acknowledges that a failure to reduce emissions associated with agriculture will impact negatively on the future economic viability of the sector, by undermining the sustainability credentials which are an important factor in the global success of Irish agri-food. However, the Group stressed that it is also important to acknowledge that many of the measures which could contribute directly to emissions reductions will have a direct economic impact on profitability of production at farm level and that the measures which have the effect of reducing beef output could impact on the competitiveness of the beef processing sector.

The Group stressed that there will be a requirement for significant financial support from both the Government and the private sector for many of these measures. As these proposed measures are developed in more detail, further consideration will need to be given to the type and level of resources required, as well as their financing, targeting and sources of funding, and their relative contribution to emissions reductions which can be counted against the inventory. In particular, farmer stakeholder representatives emphasised that a significant public financial commitment will be required to support the uptake of the recommended measures, to ensure a just transition for farmers. This is clearly reflected in Measure 10 which proposes the development of a package of supports to incentivise the implementation of the other measures in the Report.

The Group emphasises the necessity to support and facilitate young farmers entering the sector and in developing their farming enterprise in consideration of all proposed measures. Cross-sectoral efforts must acknowledge the importance of generational renewal to the continued environmental, economic, and social sustainability of the sector, and indeed the essential role which young farmers, and women in agriculture, will play in leading innovative approaches to climate action. This is clearly reflected in Measure 21 of the Report.

The need for a strategic outlook to ensure the ongoing viability of the whole sector is reflected in Measure 20 on developing the enhanced integration between the beef and dairy sectors and this is a key point where the two Groups- Food Vision Dairy and Beef and Sheep can come together.

All the parties represented on the Group understand that each has a huge responsibility to greatly increase their efforts at reducing emissions. The concerns expressed in relation to the ongoing

economic viability of the sector while undertaking these measures is an issue outside the scope of this Report which still needs to be addressed. As a final point it is very important to acknowledge that combined the Food Vision Dairy and Beef Groups have produced reports which propose measures for the dairy and beef sectors which can potentially deliver 4.28 Mt of CO2 eq without a reduction in animal numbers.

APPENDIX 1 – MEMBERSHIP OF FOOD VISION MEAT GROUP

FOOD VISION MEAT GROUP	
Organisation	**Name**
Chair	
Chair	Professor Thia Hennessy
DAFM	
ASG, agri-food strategy and sectoral development	Sinéad McPhillips
Head of Meat and Milk Policy Division	Maria Dunne
Climate Change Division	Dale Crammond
Farm organisations	
IFA – Irish Farmers Association	Brendan Golden
IFA – Irish Farmers Association	Tomas Bourke
ICMSA – Irish Creamery Milk Suppliers Association	Pat McCormack
ICMSA – Irish Creamery Milk Suppliers Association	John Enright
ICSA – Irish Cattle and Sheep Farmers Association	Edmund Graham
ICSA – Irish Cattle and Sheep Farmers Association	Eddie Punch
Macra	John Keane
Macra	Gillian Richardson /Elaine Hanrahan
INHFA[16] - Irish Natura and Hill Farmers Association	Michael Mc Donnell
INHFA - Irish Natura and Hill Farmers Association	Tom Burke
ICOS - The Irish Co-Operative Organisation Society	Ray Doyle
Industry Delegation	
MII - Meat Industry Ireland	Philip Carroll
MII - Meat Industry Ireland	Joe Ryan/Sile Sweeney
ABP – Beef Products	Kevin Cahill
Kepak	Tom Finn
Dawn Meats	Paul Nolan

[16] INHFA withdrew from the process at the beginning of meeting 7

Liffey Meats	Derek McDermot
Agencies	
Teagasc	Kevin Hanrahan
Teagasc	Paul Crosson
ICBF – The Irish Cattle Breeding Federation	Andrew Cromie
Bord Bia	Joe Burke
UCD – University College Dublin	Alan Kelly
EPA – Environmental Protection Agency	Mary Frances Rochford
AHI - Animal Health Ireland	David Graham
Food Vision Beef and Sheep Group Secretariat	
DAFM Meat & Milk Policy Division **DAFM Meat & Milk Policy Division**	Valerie Woods Gregory Murray
DAFM Support	
DAFM Meat & Milk Policy Division **DAFM Meat & Milk Policy Division**	Lydia Bagge Oliver Fitzpatrick