Sustainability – the Climate Change Challenge for Irish Dairying

A report for:



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Executive Summary

Climate change represents a challenge to which all sectors of society must respond and the Irish dairy industry is no exception. This report focuses on determining the challenge facing the Irish dairy sector post quota, looking at key competitors globally to ascertain what lessons can be learned, investigating where the Irish dairy sector is in addressing climate change and establishing what meaningful actions could be taken in Ireland.

The outlook for the dairy sector is positive with a growing and more affluent global population ensuring greater demand for dairy products. However, feeding a world population that will reach 9.6 billion¹ by 2050 while recognising the environmental limits of the planet will be a significant challenge, despite Ireland's efficient² grass-based system of dairy farming. It is anticipated that the abolition of EU milk quotas will lead to a 50% increase³ in milk production by 2020 and this will set the foundation for further growth. Yet, combined with this opportunity, comes the environmental challenge of climate change. When you consider that the greenhouse gas (GHG) methane (CH₄) emissions associated with a dairy cow are comparable to the GHG carbon dioxide (CO_2) emissions produced from the fuel used in driving a typical family car⁴, it gives an indication of the potentially negative perception the general public may have in relation to increasing milk production and cow numbers in Ireland. In addition, as a Member State of the EU, Ireland has committed to reducing its Non-Emissions Trading Sector's (NETS) GHG emissions by 20% by 2020⁵ with further subsequent reductions required. The NETS includes agriculture and Irish agriculture is currently off target with the EPA⁶ projecting only a 5% reduction in Irish agricultural emissions by 2020. Although the low mitigation potential of agriculture has been acknowledged⁷, with Ireland producing the largest proportion of GHG emissions attributed to agriculture in the EU^8 , it is clear that climate change is one of the dairy sector's most pressing challenges.

In order to ensure long-term sustainable intensification, the Irish dairy sector must take active steps to respond to climate change. A demonstrable commitment to taking resolute action in this regard will help to maintain a good relationship with society and the consumers upon which the sector depends. By being proactive rather than reactive, Irish dairying has an opportunity to

avoid the negative publicity endured by the New Zealand (NZ) dairy sector with the "dirty dairy" campaign. The Irish dairy sector can learn from their Dutch counterparts in tackling environmental challenges through strong governance, collaboration and a unified industry message and it can also mirror NZ's current strategy of investment in research and development to find innovative solutions to climate change. However, a recurring theme across the global dairy sector is the lack of awareness of the climate change challenge at farm level. While many farmers have embraced practices which have led to greater efficiency such as improvements in breeding, nutrient and grassland management, it is not always recognised that such practices are a necessary element of any effective response to climate change. There is growing awareness that efficiency, profitability and sustainable farming are mutually supportive but the dairy sector must do more to champion this message.

Greater collaboration between relevant stakeholders will be necessary to demonstrate the sector's commitment to addressing this challenge. Collaboration between an all-inclusive Dairy Activation Group (DAG) or an equivalent and the Dairy Subsidiary Board (DSB) of Bord Bia to act as governors for the climate change agenda in Irish dairying should be considered. This report recommends:

- 1. Establishment of a climate change action plan for the Irish dairy sector that sets out a structured framework to address the climate change challenge in Irish dairying.
- 2. Strong governance and support from the leaders of key dairy stakeholder groups to drive this initiative.
- 3. Appointment of a credible, independent science-based spokesperson to represent the dairy sector in discussions on climate change.
- 4. Effective and frequent communication to all relevant stakeholders on the dairy sector's message and actions to address this challenge.
- 5. Continuous support to dairy farmers and the provision of incentives to enable on-farm action.
- 6. Investigate available funding, continue investment in research and development and collaborate at international level to find long-term solutions to the climate change challenge.

By adopting this plan the Irish dairy sector will validate its sustainability credentials, prove to customers, policy makers and society at large that it is taking the issue of climate change seriously and demonstrate its commitment to action, evaluation and on-going improvement.

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Foreword

The agri-food sector is Ireland's largest indigenous industry, contributing €26 billion in turnover and accounting for approximately 9% of total employment with a particularly significant contribution to employment in rural areas⁹. The dairy sector is a key component of this success. Working in equine feed for Glanbia Agribusiness and with my husband David, farming a grassbased spring calving dairy farm in Kilkenny, I get to enjoy many aspects of agriculture on a daily basis. While many challenges exist, the agri-food sector in Ireland is an exciting and rewarding industry to be involved in.

As with many dairy farmers in Ireland, it was our intention to expand our dairy operation post quota. However, we were acutely aware of the many challenges facing us including price volatility, environmental constraints, the availability of land as well as the availability of credit. We were aware that we had many obstacles to overcome in order to be economically and environmentally sustainable in the medium to long-term. These obstacles led me to question the impact of our expansion from an environmental stand point. What were the potential regulations coming at us down the road? What would be the next restriction (quota) on production? While many environmental challenges exist, climate change appeared to be the one that was discussed less frequently and a relative unknown in terms of consequences. I saw the need to be fully aware of the global context of this challenge, to understand the potential impact on dairying in Ireland and the potential future impact of this challenge on our dairy operation at home. It was important to establish where we were in Ireland in relation to climate change and determine if there were lessons we as a sector could learn from key international competitors in addressing the challenge. There was also a need to ensure that we as farmers were fully informed and in a position to do what we could at farm level to ensure a viable farm business for the future.

As part of my research, I travelled to Sydney and Canberra in Australia for the Nuffield Contemporary Scholars Conference. I travelled to various parts of Europe and New Zealand which gave me the opportunity to see how the dairy sectors in these countries were addressing climate change and included meetings with key stakeholders at various levels throughout the dairy sector. Travel to Brussels included meetings with representatives from the EU Commission across the agriculture, environment and climate divisions and this provided me with a unique insight into how Irish dairy expansion was viewed in an EU context. Finally back in Ireland, I met with several industry representatives covering all aspects of the sector who shared their knowledge, experience and expertise in support of my Nuffield topic.

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Methodology

To set the context of this report, a review of relevant Irish, EU and global literature was carried out on climate change and how it relates to agriculture nationally and internationally. To gain an understanding of the international response to the challenge posed by climate change, the research included overseas travel to several parts of Europe and New Zealand. This consisted of interviews, meetings and conferences with a wide range of people in the global dairy sector representing different functions and perspectives. In conjunction with this, interviews were conducted with relevant stakeholders in Ireland to get a broad view of the Irish dairy industry and wider agricultural sector to determine the Irish response to the challenge posed by climate change.

Objectives

The objectives of the research were to:

- 1. To determine the climate change challenge for Irish dairy farmers and the wider dairy sector.
- 2. To look at how competitors are addressing climate change and what lessons can be learned.
- 3. To ascertain what Ireland is doing to address climate change in the dairy sector.
- 4. To investigate what meaningful actions could be taken by the Irish dairy sector in response to climate change.

Abbreviations and acronyms

°C	Degree Celsius
CH_4	Methane
CO_2	Carbon Dioxide
CSO	Central Statistics Office
DAFM	Department of Food Agriculture and the Marine
DSB	Dairy Subsidiary Board
EBI	Economic Breeding Index
EC	European Commission
ETS	Emissions Trading Sector
EPA	Environmental Protection Agency
EU	European Union
EU28	28 countries of European Union
FAO	Food and Agriculture Organisation
FFA2015	Forum for the Future of Agriculture Conference 2015
GDAA	Global Dairy Agenda for Action
GHG	Greenhouse Gas
ICOS	Irish Co-Operative Society
IPCC	Intergovernmental Panel on Climate Change
KT	Knowledge Transfer
MACC	Marginal Abatement Cost Curve
NETS	Non Emissions Trading Sector
NZ	New Zealand
N ₂ O	Nitrous Oxide
R&D	Research and Development
RDP	Rural Development Programme
SDAS	Sustainable Dairy Assurance Scheme
SDC	Sustainable Dairy Chain
SAI	Sustainable Agriculture Initiative
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

Irish dairying is the most efficient $(CO_2/kg milk)^{10}$ in the EU and the temperate climate and grass-based system of dairy farming in Ireland supports sustainable intensification. In 2014 there were 17,000 dairy farmers, the average herd size was 60 cows and the national dairy herd was approximately 1.14 million cows¹¹. With the abolition of milk quotas in the EU in April 2015, Irish dairy farmers have the opportunity to expand production for the first time in over 30 years. According to Food Harvest 2020 (FH2020)¹², a 50% increase in milk production to 7.5 billion litres by 2020 is realistic and will set the foundation for further expansion. According to the Department of Agriculture, Food and the Marine (DAFM)¹³, this expansion will come by way of a 15% increase in yield production per cow by 2020 relative to 2007-2009, and by an increase of between 300,000 and 350,000 in the national dairy cow herd. In order to realise this opportunity and ensure long-term sustainability, the dairy sector needs to tackle the challenge posed by climate change, a challenge that is recognised as the biggest environmental challenge we collectively face, in relation to both reducing GHG emissions and addressing the adverse impacts of future climate conditions¹⁴. Given that Ireland has the largest proportion of GHG emissions attributed to agriculture in the EU¹⁵, and projected to achieve only a 5% reduction in GHG emissions by 2020 versus a target of $20\%^{16}$, this will be a significant challenge.

Sustainability

According to the U.S. EPA¹⁷, sustainability is based on the simple principle of "everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment". Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs¹⁸. Sustainability in agriculture can be viewed in terms of economic, social and environmental contexts. Economic sustainability includes the issues of costs, price volatility, margin and competition. Social sustainability involves skills and labour, quality of life, succession, local community and urbanisation. Environmental sustainability includes environmental regulations, climate change, farm management practices and protecting the environment for future generations. In the context of environmental sustainability, there is a continuous and increasing focus at a global level on climate change and it is a challenge to which all sectors of society must respond. Addressing

climate change in agriculture is a considerable challenge as this sector also has the dual responsibility of feeding a growing world population.

Global context

There are significant opportunities and challenges ahead for global agriculture with the world population forecast to grow to 9.6 billion by 2050¹⁹. Agriculture represents 14% of global greenhouse gas (GHG) emissions (see Figure 1) and it is of paramount importance to feed this growing world population while reducing emissions and not damaging the environment. The Food and Agriculture Organisation (FAO)²⁰ has stated that the livestock sector faces the challenge of reducing its GHG emissions while at the same time responding to a 70 % increase in demand for livestock products by 2050. The finite amount of land and resources available for global food production must be carefully managed and replenished. Farmers will need to ensure they are producing food in a sustainable manner to achieve this and ensure the future viability of their business.



Figure 1: Global Greenhouse Gas Emissions by Source

There are significant opportunities for the Irish dairy sector post quota but in order to ensure long-term sustainable intensification, the Irish dairy sector must take active steps to respond to the challenge posed by climate change.

Source: EPA USA citing IPCC 2007²¹

2. Climate change challenge

What is climate change?

Climate change is a gradual process happening over decades and centuries. According to the US EPA²², climate change refers to any significant change in the measures of climate lasting for an extended period of time. Climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.

What causes climate change?

Human activities are affecting the climate. The US EPA²³ has stated that since the Industrial Revolution began around 1750, human activities have contributed substantially to climate change by adding CO_2 and other heat-trapping gases to the atmosphere. These GHG emissions have increased the greenhouse effect and caused Earth's surface temperature to rise.

The Irish EPA²⁴ gives examples of human activities contributing to climate change including:

- Carbon dioxide emissions through burning fossil fuels;
- Methane and nitrous oxide emissions from agriculture;
- Emissions through land use changes such as deforestation, reforestation, urbanization and desertification.

Why action is needed

Climate change is happening and every country has to play its part in addressing the challenge. According to the World Bank²⁵, experts predict that if no action is taken, the world's temperature could increase by $+4^{\circ}$ C by 2100 and this would prove catastrophic for many regions in the world. A 4°C hotter world would be one of unprecedented heat waves, severe drought, and major floods in many regions, with serious impacts on ecosystems and associated services. It has been stressed that the world cannot surpass a $+2^{\circ}$ C rise in temperature to be in a position to adapt to climate change. However, with appropriate action, warming can be held to below $+2^{\circ}$ C.

Addressing the challenge at a global level

In addressing the challenge posed by climate change, the human activities affecting it need to be tackled at an individual, national and international level. At an international level, there is a

requirement for a cohesive agreement to tackle climate change. The United Nations Framework Convention on Climate Change (UNFCCC) is playing a leading role in this regard. Each national response will be dependent on what industries and sectors are contributing to their country's GHG emissions and addressing the challenge accordingly. There is the capacity to respond to this challenge but nothing less than a collective and determined approach will suffice. According to UN Special Advisor Amina Mohammad²⁶, we are the last generation with the ability to truly affect (limit) climate change. Tackling climate change has now become extremely urgent.

2.1. Agriculture and climate change

The adverse impact of climate change on global food production cannot be underestimated. Coupled with a growing demand for food, this makes the requirement for meaningful action all the more urgent. According to Director of Agricultural Global Practice at the World Bank, Dr Juergen Voegele²⁷, global food production must continue to increase to meet increasing consumer demand but without action to reduce emissions, agriculture will account for 70 % of global carbon emissions by 2050. This is a devastating prospect. The FAO have stated that emissions from livestock supply chains are estimated to represent 14.5 % of human-induced GHG emissions²⁸. Beef and cattle milk production respectively contribute 41% and 20% of the sector's emissions. As large contributors to global GHG emissions, all sectors of agriculture must address the challenge and work towards a sustainable future. The challenge for livestock is that while methane emissions are a natural biological process associated with ruminants, they contribute significantly to overall emissions from the sector.

Greenhouse gas emissions from agriculture

The main GHG emissions as they relate to agriculture are:

- Methane (CH₄) from digestive system fermentation in ruminants and animal manure;
- Nitrous Oxide (N₂O) from the use of synthetic N fertilisers and animal manure;
- Carbon Dioxide (CO₂) derived primarily from land-use change e.g. deforestation (negative) and reforestation (positive).

The levels of these gases in the atmosphere have increased dramatically since pre-industrial times. According to the Intergovernmental Panel for Climate Change (IPCC)²⁹, the atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years.

Carbon dioxide equivalent (CO₂e)

GHG emissions are expressed in a common unit called carbon dioxide equivalent (CO_2e) . According to the Organisations for Economic Co-operation and Development $(OECD)^{30}$, CO₂e is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP) over a specific time horizon (100 years in Figure 2 below). The GWP for CH₄ and N₂O has varied slightly with each IPCC report but the figures from the IPCC 4th assessment gives an indication of the potency of CH₄ and N₂O relative to CO₂.

Figure 2: Global Warming Potential (GWP) of agricultural GHGs



Methane (CH₄) GWP of 25 times that of CO₂ Nitrous Oxide (N₂O) GWP of **298** times that of CO₂

Source IPCC, 2007³¹

Addressing the climate change challenge in agriculture

Global agriculture is vast, diverse and complex with strategies to address climate change varying between industries and countries. Addressing climate change in agriculture requires action by each individual farmer across the globe. Unlike the energy or transport sectors, global mitigation in agriculture cannot be addressed through one-off technological fixes. Rather, mitigation will require the sustained application of processes or management practices by millions of individual farmers³².

Looking at climate change in relation to the dairy sector, there are many farming practices that can improve efficiency, while at the same time, reduce GHG emissions³³. Some of these include:

- Improved breeding and animal health
- Extending grazing season and improved grassland management
- Manure management practices to ensure recovery and recycling of nutrients
- Improved feeding efficiency and animal productivity

In addition to these, there are a range of promising technologies such as feeding additives, vaccines and genetic selection methods that have strong potential to reduce emissions directly and indirectly but which require further development and/or longer time frames to be viable mitigation options³⁴. A focused effort on developing these, or similar initiatives will be determined by each country's dependency on reducing emissions from agriculture as part of their target.

2.2. Global response to climate change challenge

Climate change is a significant global challenge and the heads of the most powerful states have all committed to action. The FAO³⁵ have stated that concerted global action by all stakeholder groups is needed to design and implement cost-effective and reasonable mitigation strategies and policies. The United Nations Framework Convention on Climate Change (UNFCCC) established in 1992, provides a framework for international policy development on addressing climate change. It aims to keep the global increase in temperature to within 2°C when compared with pre-industrial temperatures. It will require a major reduction in GHG emissions globally of up to 70% by 2050³⁶. According to Food Wise 2025³⁷ the UNFCCC has targeted major reductions in GHG emissions with developed countries including Ireland expected to play a leading role.

Kyoto Protocol / Doha Amendment

The Kyoto Protocol was agreed in 1997. It is an international agreement linked to the UNFCCC which commits its parties by setting internationally binding emission reduction targets relative to 1990 levels. It recognises that developed countries are mainly responsible for the high levels of GHG emissions and places a heavier burden on these nations as a result³⁸. In 2012, the Doha Amendments were made to the protocol which gave new commitments for a second period

between 2013 and 2020 where parties committed to reduce GHG emissions further in that period. Ireland as part of the EU is legally obliged to achieve the targets set out.

EU Climate and Energy Package 2008

The EU Climate and Energy Package 2008 is a body of legislation that aims to ensure that the EU collectively meets its 2020 target under the Kyoto Protocol and Doha Amendments. The target in relation to GHG emissions is a reduction of 20% versus levels in 1990. The target is split between the emissions trading sector (ETS) for the EU's large installations, including power stations and oil refineries; and the Non-Emissions Trading Sector (NETS) which includes agriculture, transport, housing and waste. While the EU average target reduction on GHG emissions for the NETS is 10% relative to 2005, Ireland was assigned a target reduction of 20%³⁹. This is a significant challenge for Ireland due to its large agricultural sector.

Paris Climate Conference 2015

The 11th session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol will take place in Paris, France in December 2015⁴⁰. Negotiations are under way to develop a new international climate change agreement that will cover all countries and will include agreed targets for GHG emission reduction out to 2030. Countries need to put forward their proposed emissions reduction targets for the 2015 agreement in advance of the Paris conference⁴¹. Ireland, as a Member State of the EU will be part of this agreement and will be committed to achieving the targets set out for Ireland as part of the EU bill. However, the real challenge according to UN Special Advisor Amina Mohammad⁴² is that delivery on these targets will require much more than just agreement.

EU 2030 Climate and Energy Framework

In October 2014, EU leaders agreed a 2030 policy framework that set out a new target for the NETS of a reduction of 30% below 2005 levels⁴³. This framework is for submission to the UNFCCC in advance of the Paris Conference in December 2015. It will be inclusive of national Member State action plans including Ireland's Climate Action and Low Carbon Development Bill 2015.

The text agreed at the European Union Council meeting as it relates to agriculture reads as follows⁴⁴:

"The multiple objectives of the agriculture and land use sector, with their lower mitigation potential, should be acknowledged, as well as the need to ensure coherence between the EU's food security and climate change objectives. The European Council invites the Commission to examine the best means of encouraging the sustainable intensification of food production, while optimizing the sector's contribution to greenhouse gas mitigation and sequestration, including through afforestation. Policy on how to include Land Use, Land Use Change and Forestry into the 2030 greenhouse gas mitigation framework will be established as soon as technical conditions allow and in any case before 2020".

There is recognition of the importance of coherence between the food security and climate change objectives. It is important that every sector reduces emissions but future strategies to address climate change must be supportive of food security. The EU Council conclusions also acknowledge the low mitigation potential of agriculture which has significance to a country such as Ireland with a large proportion of emissions attributed to that sector. While the 'low mitigation potential' of agriculture has been recognised, this is not 'no mitigation potential', and action is required.

2.3. Climate change challenge in Irish dairying

How GHG emissions are measured in Irish agriculture

According to Bernard Hyde, Inspector, Environmental Protection Agency (EPA)⁴⁵ national data in relation to GHG emissions from agriculture are sourced from the following:

- Livestock statistics Central Statistics Office (C.S.O.) and DAFM;
- Fertilizer and lime statistics DAFM;
- Feeding practice information Irish research and IPCC guidelines;
- Manure management data Farm Facilities Survey 2003 and National Farm Survey 2010.

However there is a need for much more data in relation to farm management and manure management⁴⁶. Assessment of actual 'on the farm' emissions need to be captured as well as improvements made. The challenge for Ireland is to ensure that improvements made at farm level in relation to GHG emissions are captured and included in national inventory.

Irish agricultural emissions

In 2012, agriculture accounted for 10.3 % of total EU emissions across the 28 countries in the European Union (EU28). In Ireland, agriculture represented 30.7% of emissions⁴⁷, see Figure 3. In the EU28, agriculture represented 17.5 % of NETS emissions while in Ireland, the figure was 43.2%. Therefore, Ireland is uniquely placed in Europe, having the largest percentage of emissions attributed to agriculture. This is of significance when reduction targets for GHG emissions in the NETS are considered.

Figure 3: %	agricultural	emissions	in EU28
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		Share of agric in total emissions in 2012	Share of agric in ESD (non-ETS) emissions 2012	
		(4)	(B)	
<	Ireland	30,7%	43.2%	
	Denmark	18.6%	28.8%	
	France	18.2%	23.4%	
	Sweden	13.3%	19.6%	
	Finland	9.4%	18.3%	
	Latvia	22.0%	29.4%	
	Lithuania	23.4%	31.8%	
	Germany	7.4%	14.3%	
	United Kingdom	8.9%	14.9%	
	Netherlands	8.3%	13.8%	
	Austria	9.4%	14.5%	
\leq	EU28	10.3%	17.5%	
	Estonia	6.9%	23.5%	
	Bulgaria	10,4%	24.4%	
	Belgium	7.9%	12.6%	
	Romania	15.3%	25.7%	
	Poland	9.2%	18.1%	
	Spain	11.1%	18.7%	
	Luxembourg	5.7%	6.8%	
	Slovenia	9.9%	16.6%	
	Croatia	12.7%	16.3%	
	Portugal	10.5%	16.7%	
	Italy	7.5%	12.3%	
	Czech Republic	6.1%	13.0%	
	Greece	8.2%	18.5%	
	Cyprus	8.8%	16.8%	
	Slovakia	7.3%	14.3%	
	Hungary	14.0%	21.4%	
	Malta	2.5%	7.3%	

Source: Prof. Alan Matthews 2014⁴⁸

The distribution of agricultural emissions in Ireland in Figure 4 highlights the contribution of the livestock sector to agricultural emissions and in turn national emissions. Methane (CH₄) at 44% and nitrous oxide (N₂O) at 38% make up the majority of Irish agricultural GHG emissions due to the large number of livestock within the sector and this highlights the climate change challenge facing Irish dairy farmers as they increase production.





Source: DAFM⁴⁹

Expansion in Irish dairying

With the abolition of milk quotas, a 50%⁵⁰ increase in milk production in Irish dairying is predicted by 2020 via increases in efficiency and overall cow numbers. According to Teagasc⁵¹, further expansion, additional to FH2020, is more likely to be based around a direct increase in dairy cow numbers and while this may still result in a continuous improvement in emission intensity, it may be difficult to achieve this further increase in dairy cow numbers without an absolute increase in GHG emissions. While Ireland has committed to reducing its GHG emissions in NETS (of which agriculture is part) by 20% by 2020⁵², according to the EPA ⁵³, only a 5% decrease in agricultural emissions by 2020 relative to 2005 is projected.

There will be further targets set out for Ireland out to 2030 at the Paris Climate Conference. Irish dairying must strive to reduce emissions further, it cannot allow GHG emissions reduction be the next quota on production, therefore action to address the challenge is needed.

3. External perspective

The author met with a wide range of relevant stakeholders to investigate their response to climate change and to help determine what the Irish dairy sector could learn. An appreciation of the experiences of others as they address climate change should lead to greater overall understanding and provide opportunities to collaborate.

Non-governmental organisations (NGOs)

NGOs are strong lobby groups and are passionate, articulate and focused on addressing the climate change challenge both nationally and globally. For greater clarity on this challenge, it is important that all relevant stakeholders have open dialogue and understand each other. John Muldowney, climate change and bioenergy division in DAFM ⁵⁴ stated that DAFM regularly meet with NGO representatives (environmental and civil society) on climate change with the purpose of keeping an open line of communication and establishing discussions based on sound science when addressing the challenge of agriculture and climate change.

According to Charles P. Stanley Smith, member of the board of directors with An Taisce⁵⁵, they see animal numbers increasing with associated GHG emissions and there is not enough action to address it. They want to know if GHG emissions targets are not met, who pays the fine. Óisin Coughlan, Director of Friends of the Earth⁵⁶ stated that there is a big behavioural change needed when it comes to climate change and the debate should not be around why targets are unfair, rather how targets can be achieved. He urges swift action by all sectors of society in addressing this challenge. There is a general feeling among the NGOs who met with the author that no action is being taken to address this challenge and climate change is being ignored. Therefore it is important the Irish dairy sector understands these concerns and has the opportunity to communicate its own progress and planned actions to address the challenge. If there is no communication, assumptions can be made which can damage one or both sides of a debate.

There are many organisations, alliances and programmes founded on the basis of global collaboration among relevant stakeholders with the aim of ensuring a more sustainable future for agriculture and society at large. One of their aims is tackling the climate change challenge. Three of these are discussed below:

1. Global Alliance for Climate Smart Agriculture (GACSA)

This collaborative international alliance is promoting the application of climate smart processes in agriculture. Its diverse membership includes governments, NGOs, financial institutions, research/extension/education organisations, and participants from the private sector. According to GACSA⁵⁷, members of the Alliance recognise the urgent need to act at scale and to contribute towards sustainable increases in agricultural productivity and incomes; greater resilience of food systems and farming livelihoods; and reduction and/or removal of greenhouse gas emissions associated with agriculture where possible. Ireland is an active participant in GACSA through DAFM and this provides a global forum for discussion on the climate change challenge facing agriculture and potential strategies to address it. Food Wise 2025 sees the benefit of this alliance and recommends DAFM continues active participation in it⁵⁸.

2. SAI Platform

The Sustainable Agriculture Initiative (SAI) Platform⁵⁹ is the main food and drink industry initiative supporting the development of sustainable agriculture worldwide. The SAI Platform facilitates the sharing of knowledge at precompetitive level to support the development and implementation of sustainable agriculture practices. It includes participants throughout the food chain, has over 70 members globally and in an Irish context, Glanbia is an active member and Bord Bia is an affiliate member. It also actively works and partners with farmer organisations, NGOs, and academic and scientific institutions to promote sustainable agriculture. The SAI Platform participates in many global initiatives including the Global Dairy Agenda for Action discussed later. In a dairy sector context, the SAI Platform joined forces with the Livestock Research Group of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) to publish 'Reducing Greenhouse Gas Emissions from Livestock: Best Practice and Emerging Options'. The aim is to share information about mitigation options based on best practices.

Figure 5 provides a useful summary of the various mitigation options that could be considered on Irish dairy farms. There are many similarities to the Teagasc Marginal Abatement Cost Curve (discussed later).





Source: SAI Platform & GRA⁶⁰

Participation in the SAI Platform by relevant stakeholder groups in the Irish dairy sector would benefit the overall industry as it provides an opportunity for global co-operation and a global forum with relevant stakeholders to discuss strategies to address climate change.

3. Global Dairy Agenda for Action

The SAI Platform is a member of the Global Dairy Agenda for Action (GDAA). The GDAA provides governance for the global dairy sector's efforts in addressing its sustainability challenges. The Dairy Sustainability Framework (DSF)⁶¹ is the GDAA program for aligning and

connecting sustainability initiatives to demonstrate leadership and progress on sustainability globally. In an Irish context, Glanbia is a full implementing member and Bord Bia is an affiliate member. A benefit of this initiative is the opportunity to share information with similar organisations on issues that affect the dairy sector globally but which are still categorised as pre-competitive challenges. There is also the opportunity to share this information and proof of measurement with third parties. Being part of the GDAA demonstrates desire and commitment to address the sector's sustainability challenges and gives Irish dairying a voice in global discussions on topics such as climate change. Participation in GDAA should be considered by other relevant stakeholders in the Irish dairy sector.

3.2. International competitors

While the global dairy market is a competitive one, considerable scope for collaboration exists in relation to areas of pre-competitiveness. Such issues include environmental challenges and the public perception of dairy. There is a lot of information that can be shared between nations and various stakeholder groups with the ultimate goal of strengthening the dairy sector image globally. There are also lessons the Irish dairy sector can learn from its international competitors.

1. The Netherlands

According to "Fit for the Future – The Economic Power of the Dairy Sector"⁶², there are 1.5 million dairy cows on 19,000 dairy farms producing 12 billion kgs of milk in the Netherlands. Agriculture represents 8.3%⁶³ of total Dutch GHG emissions (versus Ireland's 30.7%) and while its dairy sector plans to increase dairy output by 20% post quota, growth will be climate neutral. The sector recognises the challenges associated with dairy expansion and takes this responsibility seriously. It has key stakeholders within the dairy industry driving the sustainability agenda and it has a clear strategy for environmental sustainability. The key challenges facing the Dutch dairy sector according to Petra Tielmans, project leader of Sustainable Dairy Chain (SDC)⁶⁴ are ammonia and phosphates; greenhouse gas emissions and public perception. These challenges are addressed through the SDC which is a joint initiative between the Dutch Dairy Association

(NZO) and LTO Netherlands (farmer organisation). It brings dairy farming and industry together to agree concrete goals for sustainability including climate change targets. It also works closely with Wageningen UR (University and Research Centre) on data capture. The governance in the SDC is strong and it is an implementing member of the GDAA. The author met with the SDC, milk processors and the LTO and each highlighted the importance of working together on pre-competitive common goals. They see the benefit to the Dutch dairy sector with this collaborative approach and the SDC is a strong framework within which to operate. Jaap Petreaus, manager of corporate environmental affairs and sustainability with Friesland Campina⁶⁵ highlighted the "burning platform" turning point for the Dutch dairy sector. The dairy sector received correspondence from the Dutch government outlining the phosphates issue and their plans to limit dairy cow numbers post quota unless a plan was put in place to address it. This instigated swift action by the Dutch dairy sector to address this challenge and implement an action plan through SDC. The restriction on cow numbers did not happen but strict nutrient management plans at farm level were deployed. The Irish dairy sector should not wait for the "burning platform" before responding to its climate change challenge. The Dutch dairy sector is addressing its environmental challenges through strong governance, collaboration and a unified industry message and the Irish dairy sector could benefit from a similar approach.

While the wider dairy industry in the Netherlands is on the one page in relation to tackling climate change, there was evidence of a lack of awareness of the climate change challenge at farm level. The author met with a number of farmers and while they were efficient, motivated and compliant (with regulations), they did not consider the link to addressing climate change and felt they had more immediate challenges to address. While the Dutch dairy sector responds to the challenge posed by climate change through nutrient management for example, the link to GHG reduction is not always considered at farm level. This issue is not unique to the Netherlands.

2. New Zealand

The New Zealand (NZ) dairy sector has key strengths with its scale and a world class grassbased dairy production system. While dairy production stagnated in Ireland following the introduction of milk quotas in 1984, New Zealand (NZ) underwent large expansion with output trebling to 15 billion litres per annum⁶⁶. NZ has the largest proportion of emissions attributed to agriculture globally at 48.4%, see Figure 6 and according to the NZ submission to the ADP⁶⁷ (Ad Hoc Working Group on the Durban Platform for Enhanced Action), it commits to reduce GHG emissions to 30% below 2005 levels by 2030.

Figure 6: NZ's 2013 greenhouse gas emissions by sector



Source: NZ national inventory report submitted to the UNFCCC in April 2015

NZ is home to the largest dairy processor in the world, Fonterra which came about through a consolidation of a number of milk processors in NZ. According to Jim van der Poel, former Fonterra director⁶⁸, the importance of dairy sector consolidation when competing on a global market cannot be overemphasized.

NZ recognises climate change as a serious issue but considers water quality a more significant challenge to its dairy farmers at this time. Following the stringent criticism they have received in relation to environmental concerns, particularly in the context of water quality, the NZ dairy sector is trying to regain its positive public image. The Fish and Game lobby group has continually raised the issue of water quality leading to the "dirty dairy" campaign in NZ. This has focused the NZ dairy sector's attention on introducing the necessary reforms. A challenge

for the NZ dairy sector is collating and acting on the different regulations set out for water quality and nutrient management depending on which regions farms are located. However, Fonterra is a key driver of the NZ dairy sustainability programme and are co-operating with all of the regional councils. They also have a large team on the ground working with farmers to help address environmental challenges at farm level.

To address these challenges, the NZ dairy sector is supported by a world class research and development infrastructure. They are proactively seeking solutions to the challenge posed by climate change and according to Alan Matthews Professor of European Agricultural Policy at Trinity College Dublin⁶⁹, NZ are vigorously pursuing research on mitigation options in the livestock sector. Dairy NZ, Massey University and Lincoln University are all focused on on-farm initiatives to solve environmental challenges, see Figure 7 for examples. The Irish dairy sector needs to mirror the NZ strategy of investment in research and development for climate change mitigation and continue to collaborate and share research with them.

Figure 7: Examples of research in dairy sector in New Zealand



Source: Photos by author taken at Australasian Science Symposium, November 2014

The Irish dairy sector is based on a sustainable model of farming and the industry is both proactive and driven, committed to delivering sustainable intensification in Irish dairying. There are many aspects to dairying in Ireland that need to be considered when determining how the sector can address climate change, one of which is the structure of Irish dairy farms. The family farm structure is prevalent in Irish dairy farming and this will remain the case. Dairy farmers regard themselves as custodians of the land and are committed to passing their farms on to the next generation in the best condition possible. This mind-set ensures a commitment to effective management and environmental protection. There are many other factors that should also be considered.

4.1. Efficient farming

Ireland has the largest proportion of emissions attributed to agriculture in the EU, however, independent research carried out by the European Commission evaluated the dairy sector's contribution to EU GHG emissions and determined that Ireland had the lowest emissions per kg of milk in the EU⁷⁰, see Figure 8.





Source: Joint Research Centre, European Commission⁷¹

81% of agricultural area in Ireland is devoted to pasture, hay and grass silage⁷². The temperate Irish climate and long grass growing season supports an efficient and sustainable model of dairy farming. The longer cows can remain at grass, the lower the cost of production and extended grazing is considered a key efficiency metric in Irish dairy farming. Land under grass when managed effectively can increase carbon uptake as well as improve productivity. According to the FAO⁷³ implementing grassland management practices that increase carbon uptake by increasing productivity or reducing carbon losses can lead to net accumulation of carbon in grassland soils – sequestering atmospheric CO₂.

Farmers have increased efficiency through targeted measures such as improvements in herd EBI, reproductive efficiency and milk solids output per cow⁷⁴. This coupled with improved grassland and nutrient management are all contributing to Ireland's efficient status. However, more progress is needed and an industry focus on this can deliver farm profitability and simultaneously contribute to a reduction in GHG emissions.

4.2. Research and development

According to FAO⁷⁵, research and development (R&D) can play an important supporting role in addressing the climate change challenge by generating knowledge and evidence about technologies and practices, giving farmers and practitioners greater confidence about their mitigation effectiveness and production impacts. Teagasc (the agriculture and food development authority in Ireland) in Moorepark plays an important role in R&D in dairying in Ireland, the expertise and professionalism of which is acknowledged worldwide. According to Teagasc⁷⁶, research at Moorepark endeavours to anticipate the production needs of a rapidly changing industry and develop sustainable systems of milk production that will advance the competitive edge of Irish dairy farmers on the global market. Many farmers have embraced recommended practices including improvements in breeding, nutrient management and grassland management and this has led to greater efficiency on-farm. According to Kevin Twomey, dairy farmer⁷⁷, it is crucial that progressive farmers continue to push for new developments in farming, adopt these technologies and seek assistance from advisory services as required.

Collaboration and on-going investment in R&D across the dairy supply chain in Ireland is essential to finding viable solutions. As stated by the FAO⁷⁸, R&D is vital for increasing the availability and affordability of effective mitigation options to address climate change. Teagasc also co-operates with a number of international dairy research centres including Dairy NZ and Wageningen UR in the Netherlands and the sharing of knowledge, innovation and collaboration with international dairy centres of excellence will be critical towards finding innovative solutions to climate change in Irish dairy farming.

4.3. Advisory service

Agricultural advisors are an integral part of Irish dairy farming and support farmers through the sharing of knowledge and advice on a range of agricultural issues on a daily basis. There are highly qualified independent advisors in addition to the advisors who form part of the extension service in Teagasc. Within the context of responding to climate change, agricultural advisors can assist dairy farmers through education and supporting initiatives designed to address it.

Teagasc offer an excellent advisory service that offers independent, professional and researchbacked advice. However, the provision of sufficient numbers of advisors remains challenging. Dr Tom Kelly of Teagasc⁷⁹ stated that the major concern is the projected reduction in advisory staff in Teagasc from 240 to 180 by 2020 which will damage the advisor farmer relationship and reduce technology transfer capability. According to Tom Tynan, member of Cabinet of EU Commissioner for Agriculture Phil Hogan⁸⁰, there is an urgent requirement for more advisors on the ground supporting and advising farmers in order to effect action on climate change. There is a need to recruit additional on-farm advisors and up-skill existing advisors to ensure an adequate advisory service is available for dairy farmers as they address the climate change challenge.

Milk processors in Ireland work closely with their farmer suppliers to ensure the highest quality standards are maintained at all times. The author met with Glanbia, Carbery and Kerry who have teams of milk quality advisors working with their farmers to support the production of a high quality sustainable milk pool. These milk advisors also support dairy farmers in areas of

sustainability. In addition to milk quality advisors, Glanbia have a specialist sustainability team to assist farmers participating in the Bord Bia Sustainable Dairy Assurance Scheme (SDAS)⁸¹. According to Anne Browne, Farm Sustainability Manager with Glanbia⁸², Glanbia has signed up to the Origin Green Charter⁸³ and has included the requirement to participate in SDAS as part of their milk supply agreement. To support this, the sustainability team works with individual farmer suppliers in advance of the independent audit and in follow-up close outs afterwards. All milk processors should consider expanding their advisory team to offer additional support to farmers on sustainability measures. This additional support would facilitate action at dairy farm level in addressing climate change.

4.4. Knowledge transfer groups / discussion groups

Knowledge transfer (KT) groups or discussion groups have been identified as an excellent vehicle for the provision of advice and education to farmers on environmental challenges such as climate change. According to DAFM⁸⁴, KT groups are designed in such a way as to ensure the farmer and advisor engage in one-to-one discussion on key aspects of a farmer's business, including environmental sustainability. A suite of knowledge transfer measures are included in the new Rural Development Programme (RDP) 2014-2020, and will consist of support for dairy KT groups. This is an excellent opportunity to bring a greater focus to climate change in dairying.

According to FAO 2013⁸⁵, extension and capacity-building policies [such as the KT groups] can facilitate the transfer and use of more efficient practices/technologies that are readily available. As recommended by Food Wise 2025⁸⁶, it is essential that on-going funding is made available through national programmes to assist in securing farmer engagement on climate change. A climate change focused KT group would support the use of practices such as those classified as "win-win" (or double dividend) in the Teagasc MACC curve and assist the dairy sector in addressing climate change.

According to Teagasc, the marginal abatement cost curve (MACC) quantifies the current opportunities for reductions in GHG emissions in agriculture, as well as the associated costs/benefits⁸⁷. It highlights that most of the cost-beneficial mitigation measures are expected to both reduce GHG emissions and increase farm profitability (win-win). Examples include: additional increases in the Economic Breeding Index (EBI), extended grazing and nitrogen efficiency, see figure 5. As recommended by Food Wise 2025⁸⁸, the Teagasc MACC will need to be continually updated to ensure that the latest technological developments are included. An updated version is due in 2016.

Figure 9: Teagasc Marginal Abatement Cost Curve using IPCC analysis Colours indicate measures based on efficiency (green), land use change (yellow) and technological interventions (blue)





Source: Schulte et al 2012⁸⁹





Source: Schulte et al citing Motherway & Walker 2009⁹⁰

Prof. Alan Matthews⁹¹ questioned why the large win-win (double-dividend) options in the MACC have not already been exploited, see figure 6. A specific climate change action plan for Irish dairying would support action on the ground to deliver this.

4.6. Origin Green and Sustainable Dairy Assurance Scheme

Bord Bia's Origin Green⁹² is the national sustainability development programme designed to help Ireland become a world leader in sustainably-produced food and drink. It is independently verified and operates on a national scale, representing government, private sector and food producers. Origin Green is a marketing success story for Irish agriculture. Friesland Campina's manager of environmental affairs and sustainability, Jaap Petreaus⁹³ stated that it was a programme to be admired and from which other dairy sectors could learn. According to Mairead McGuinness, Vice-president of the European Parliament and regular spokesperson on Irish agriculture⁹⁴, people buy into Origin Green and it is essential that the message remains credible

authentic and measurable. The Irish dairy sector must ensure it has a robust model built around Origin Green to ensure this.

As part of Origin Green, a quality standard, the Sustainable Dairy Assurance Scheme (SDAS)⁹⁵ was developed by a technical advisory committee (TAC) representing Bord Bia, Teagasc, the Food Safety Authority of Ireland (FSAI), DAFM, industry (producers and processors) and other technical experts. Overall governance and control of the scheme rests with the Dairy Subsidiary Board (DSB) of Bord Bia but the TAC has responsibility for drafting the standard and formulating any required amendments. SDAS sets out the quality assurance criteria as well as providing a uniform mechanism for recording and monitoring the sustainability criteria of the farm. A farm visit is conducted by an independent auditor at 18 month intervals and a comprehensive report is produced on the performance of the farm under the sustainability and quality assurance criteria⁹⁶. The majority of requirements for SDAS are necessary in a cross-compliance inspection so that farmers who have passed the audit will be prepared for a cross-compliance inspection should it arise. One can't manage what they don't measure and to facilitate measurement at farm level, making this audit mandatory in the medium term should be considered.

This framework provides a viable option upon which to develop a climate change action plan at farm level and including a specific section in the SDAS audit focussed on addressing climate change could facilitate this. With development and strong industry support this framework can advance action at dairy farm level.

4.7. Carbon Navigator

The Farm Carbon Navigator ⁹⁷ was developed by Teagasc and Bord Bia. It is an online software tool that educates users on how their farm produces GHG emissions and can establish using SDAS data, the carbon footprint for individual dairy farms. It identifies mitigation capacity and sets targets and a pathway to reduce emissions. It is used to measure and improve carbon efficiency across five key efficiency measures including:

• Length of the grazing season

- Improved genetics and breeding (increased EBI)
- Improved nitrogen efficiency
- Improved manure management
- Energy efficiency

The author welcomes the decision to make the carbon navigator an integral part of the beef genomics programme and the dairy sector can learn from the beef sector's experience in this regard. Commitment to a nationwide roll-out of the Farm Carbon Navigator in measuring, confirming, and improving actions to tackle climate change at dairy farm level would support the industry's climate change action plan.

4.8. Public image

The Irish dairy sector can learn from the New Zealand experience and be proactive rather than reactive in managing its public image. It is crucial that Irish dairying protects its hard-won image of sustainability, with a focus on high-quality products, environmental best practice and high standards of animal welfare. The grass-based system of farming supports all of these elements and is one of the sector's many strengths. However, there is a growing public demand for action on climate change and the dairy sector must respond. The low mitigation potential of agriculture has been acknowledged but there is still scope to act. Within this context, and in order to maintain and enhance its green image, the dairy sector needs to regularly communicate to society its message and the actions it is taking to address climate change.

4.9. What else could help address this challenge

Ireland has a very successful agricultural sector, and in approaching the issue of climate change, the dairy sector must consider what other factors would help address this challenge.

The Irish dairy sector urgently requires a credible spokesperson that can engage with and reassure the general public in relation to the challenges posed by climate change in Irish dairying. In the on-going absence of such a spokesperson, there is a risk that social media will fill the vacuum in relation to queries, by providing anecdotal rather than evidence-based responses. The dairy sector needs to appoint an independent, sciencebased climate and dairy expert as their spokesperson. This would ensure a credible point of contact for the media and public when the topic is discussed.

4.9.2. Dairy Expansion Activation Group

As part of FH2020, a Dairy Expansion Activation Group⁹⁸ was set up to address the actions needed to implement the dairy sector recommendations of FH2020. This small action group, chaired by Dr. Sean Brady and comprising of farmers, processors and Teagasc⁹⁹ proved effective. There is the potential for a similar group to be set up to address the specific actions needed to implement the recommendations of Food Wise 2025. This Dairy Activation Group (DAG) or an equivalent would offer the opportunity as part of its remit to address the specific actions required to implement a climate change action plan in Irish dairying.

4.9.3. European Innovation Partnerships

There is European funding available for R&D and innovation in agriculture. European Innovation Partnerships (EIPs) ¹⁰⁰are a new approach to EU research and innovation and consist only of activities, in which government intervention is clearly justified.

EIP-Agri

EIP agricultural productivity and sustainability (EIP-Agri)¹⁰¹ aims to foster a competitive and sustainable sector that achieves more from less. To achieve this, EIP-Agri brings together innovation "actors" (farmers, advisors, researchers, businesses, NGOs, etc.) into operational groups to help build bridges between research and practice and speed up

innovation on the ground. Each group is project oriented and composed of the "actors" that are in the best position to realise the project's goals. EIP-Agri operational groups can be funded under Rural Development Programmes (RDPs) and one measure included in the Irish RDP is to support the establishment and operation of EIP-Agri operational groups¹⁰². According to Tom Tynan¹⁰³, there are 118 RDPs across the EU with an EU budget spend of almost €100 billion between 2014 and 2020 and once the RDPs are adopted, funding will become available for EIP Agri Innovation projects that look at tacking specific practical issues.

According to DAFM¹⁰⁴, the purpose of the EIPs is to promote the sustainable development of agriculture and help the Irish agricultural sector to become more productive and efficient by:

- supporting operational groups to address challenges in areas such as climate change;
- bringing together farmers, NGOs, private sector bodies, research institutions and advisors in a partnership type approach to address challenges identified;
- disseminating information through appropriate channels including EIP networks

More interaction is envisaged through the operational groups and multi actor projects with the objective being to strengthen participation of farmers and advisors in research and innovation according to Tom Tynan¹⁰⁵. He highlights the need to explore the best ways to engage advisors in forming part of these operational groups and multi actor projects. In addressing the challenge of climate change in Irish dairying, there is the opportunity to investigate the availability of EIP funding to support R&D in climate change mitigation and in seeking innovative solutions to the challenge at dairy farm level.

4.9.4. Effective communication to farmers

How do you get farmers wanting to be responsible for this challenge? There is a lack of awareness at farm level of the challenge posed by climate change. Farmers are focused on addressing the tangible environmental challenges facing them and although efficient, the climate change challenge is not as visible and therefore not as urgently considered. There is an on-going requirement to communicate to farmers on the challenge posed by climate change as well as the recommended measures to address it. Increased media discussion, focused advisory support, a climate specific KT group and milk processor communication will facilitate this. The dairy industry must collectively deliver the message on the climate change challenge to farmers via all available channels.

Efficiency, profitability and sustainable farming are mutually supportive and there is the opportunity for high profile, progressive farmers to more frequently speak about the correlation between efficient farming, climate change mitigation and farm profitability to build awareness of the challenge posed by climate change among the farming community. This message needs to be championed throughout the dairy sector.

4.9.5. Incentives

There is the opportunity to direct change through exchequer incentives which would be mutually beneficial and thus self-financing. The FAO 2013¹⁰⁶ stated that while many mitigation practices are likely to be profitable in the mid-term, public policies should ensure farmers can cope with initial investment and possible risks. If the dairy sector adopts the win-win measures described in Teagasc's MACC, they are a win for climate change mitigation as well as a win for the farmer. Other measures, if incentivised would also deliver results. If the dairy sector takes ownership of the climate change challenge and develops an effective action plan, the sector will be in a stronger position to seek support for mitigation measures that require capital investment if deemed cost beneficial to the national agenda.

4.9.6. Strong governance, leadership and collaboration

To effect action on climate change at farm level, strong governance and leadership are essential. Jim van der Poel, former Fonterra Director¹⁰⁷ stated that the governors of the industry must take ownership of this challenge to ensure effective action to address it. Jaap Petreaus¹⁰⁸ advised that the relevant stakeholders of the Irish dairy sector need to

establish a co-operative way of building a sustainable dairy industry in Ireland to address this challenge. Climate change is a pre-competitive issue and all relevant stakeholder groups should work together to instigate action. Leadership, strong governance and collaboration will be needed to successfully implement a climate change action plan in the Irish dairy sector.

4.9.7. Learning from the Nitrates Directive

The Nitrates Directive (91/676/EEC) has the objective of reducing water pollution caused or induced by nitrates from agricultural sources and preventing further such pollution, with the primary emphasis being on the management of livestock manures and other fertilisers¹⁰⁹. Compliance with the Nitrates Regulations is one of the Statutory Management Requirements under the Single Payment Scheme¹¹⁰.

Matt Dempsey, chairman of the Royal Dublin Society (RDS)¹¹¹ stated that the Nitrates Directive came into law almost 10 years before Ireland was forced to act and this was very costly. Initially, it was challenging to dairy farmers but it has proved to be an effective tool in reducing fertiliser usage and improving water quality. Michael Hamell¹¹², former DG Environment representative stated that the nitrates directive was one of the most successful measures which improved environmental sustainability at farm level. It is positive that Ireland has adapted its farming practices in compliance with the Nitrates Directive in advance of expansion and it will continue to comply in the post quota era. By contrast in New Zealand, nitrates regulations have come into force post expansion and this has posed a bigger challenge for New Zealand dairy farmers.

Complacency in relation to climate change is simply not an option and the dairy sector can learn from the Nitrates Directive experience. The dairy sector needs to proactively respond to the climate change challenge before any potential legislation is imposed on the industry.

5. Conclusions

This report focused on determining the challenge facing the Irish dairy sector post quota, looking at key competitors globally to ascertain what lessons could be learned, investigating how the Irish dairy sector is addressing climate change and establishing what meaningful actions could be taken in Ireland as it strives towards sustainable intensification and climate change target compliance. The Irish dairy sector cannot allow GHG emissions reduction become the next quota on production, therefore action is required. Commitment, effective communication, measurement and focus on continuous improvement will reap rewards.

- Climate change is a reality and it is imperative that every country, sector and individual play its part to reduce GHG emissions.
 - The EU is playing an active role in addressing the global challenge of climate change. As a Member State of the EU, Ireland has challenging targets for reducing emissions and is taking the challenge very seriously.
 - The Irish target for the NETS (which includes agriculture) is a 20% reduction.
 However the EPA projects only a 5% decrease in Irish agricultural emissions by 2020 relative to 2005.
 - The low mitigation potential of agriculture has been acknowledged in EU
 Council conclusions and this will be of significance to Ireland with its large proportion of agricultural emissions when 2030 targets are being agreed.
 - A challenge for Ireland is to ensure that improvements made at dairy farm level in relation to GHG emissions can be captured, measured and included in national inventory. This is currently not the case.
- The Irish dairy sector must consider the external perspective when addressing the challenge of climate change.
 - There are a number of international bodies that provide opportunities for the Irish dairy sector to co-operate and collaborate on climate change at an international level. This can give Ireland a voice in global dairy climate change discussions.

- The Dutch dairy sector tackles its environmental challenges through strong governance, collaboration and a unified industry message and this approach has proven effective.
- New Zealand has a world class sustainable grass-based dairy production system which is supported by an excellent research and development infrastructure. Following the stringent criticism they have received in relation to environmental concerns, particularly in the context of water quality, the NZ dairy sector is now focused on introducing the necessary reforms.
- Ireland has a green image and an efficient dairy farming model. To validate its sustainability credentials it has the opportunity to demonstrate its commitment to action, evaluation and on-going improvement when addressing the climate change challenge.
 - Origin Green is proactive in promoting Ireland's green credentials. SDAS, as part of Origin Green is an excellent framework upon which to build a more comprehensive programme to address climate change in Irish dairying.
 - Support on the ground for farmers is critical. There is a good model of research and advisory assistance in Irish dairying but there are significant opportunities to focus and enhance this support when addressing the climate change challenge.
 - There is European funding available for R&D and innovation in agriculture through EIP and it provides the opportunity for farmers, advisors and other relevant stakeholders to collaborate on projects that seek to address challenges such as climate change.
 - There is a lack of awareness of the challenge posed by climate change at farm level and more discussion and debate among farmer peers can build awareness.
 - Efficiency, profitability and sustainable farming are mutually supportive and the dairy sector can do more to champion this message.
 - Irish dairying can learn from the Nitrates Directive experience and proactively respond to the climate change challenge before any potential legislation is imposed.

6. Recommendations

This report makes a number of recommendations to address the challenge posed by climate change in Irish dairying.

- Establish a climate change action plan for the Irish dairy sector that sets out a framework to address the climate change challenge. This requires a collaborative effort between a Dairy Activation Group (DAG) or an equivalent and the Dairy Subsidiary Board (DSB) of Bord Bia (governors of SDAS) to act as governors for the climate change agenda in Irish dairying. Requirements of the plan:
 - The body should be all-inclusive so that all relevant stakeholders can participate, influence and drive this initiative.
 - Strong governance will be required to develop and then implement the climate change action plan for the Irish dairy sector.
 - The climate change action plan should set out a framework to address the challenge posed by climate change at dairy farm level and should include an on-farm audit, KT plan, advisory support plan, R&D plan and communications plan.
 - For data capture and measurement; enhancement of the current Bord Bia SDAS to include a specific section on climate change and a national roll out of the carbon navigator is recommended.
 - The on-farm audit should be made compulsory in the medium term but dairy farmers will need to be fully supported by milk processors, agricultural advisors and the wider dairy sector to ensure effectiveness.
- 2. A credible, independent, science-based spokesperson should be appointed to represent the dairy sector in discussions on climate change. The industry body could be mandated with this selection and the appointee will, in turn, be an active participant in communicating the climate change action plan.

- The Irish dairy sector must improve the communication of its message and actions to address climate change to society, customers, farmers and all other relevant stakeholder groups. A communications plan should form part of the overall action plan. It should include:
 - Communication with environmental communities.
 - Communication with customers and society.
 - Communication with farmers via all available channels including dialogue with high profile, progressive farming peers.
- 4. To facilitate on-farm action, additional and continuous support for dairy farmers should be sought as part of the climate change action plan. This support should be through:
 - Recruitment of additional agricultural advisors to support farmers on the ground.
 - Continuous up-skilling of existing advisors on climate change.
 - Knowledge transfer group with a specific climate change focus.
 - Provision of exchequer incentives when deemed cost beneficial to national agenda.
 - Pre-audit support to farmers from milk processors.
- 5. Continuous investment in R&D and new technologies is required in order to find long-term solutions to the sector's climate change challenge. This will require:
 - Collaboration, sharing information and on-going co-investment in R&D across the dairy supply chain in Ireland.
 - Sharing of knowledge among international dairy research centres of expertise.
 - Progressive farmers adopting new technologies and encouraging uptake among peers.
 - Investigating the availability of EIP funding for R&D to address the challenge at dairy farm level.
 - Explore the best ways to engage farmers and advisors in forming part of EIP operational groups and multi actor projects.
- 6. While Ireland is committed to partaking in the GACSA, other initiatives that are industry-led such as the Global Dairy Agenda for Action and SAI Platform need to be strongly considered by relevant stakeholders to ensure Ireland's dairy sector can influence the global dairy climate change discussion.

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