

**Department for Environment, Food and Rural Affairs**

# **Paper 1: Background**

**November 2012**

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## Summary and key messages

1. The Climate Change Act 2008 sets a legally binding commitment of at least an 80% cut in Greenhouse Gas (GHG) emissions by 2050 measured against a 1990 baseline. To support progress towards achieving this ambition, a carbon budgeting system which caps GHG emissions over five year periods, has been established with the first three carbon budgets running from 2008 – 2012, 2013 – 2017 and 2018 – 2022. Carbon budgets cap GHG emissions from the overall 'carbon' economy but do not set targets for sectors as action to reduce GHG emissions is focused on areas where cost effective savings may be achieved. The level of savings between sectors of the carbon economy will therefore vary to reflect the unique challenges and circumstances each face.
2. It is estimated agriculture emits around **9%** of the UK's GHG emissions<sup>1</sup>. This is a significant proportion of the overall carbon economy. Because of the limitations in the way we currently measure GHG emissions from agriculture, these estimates are uncertain<sup>2</sup>. For example, current estimates do not fully reflect the positive actions farmers have already made to their farming practices. This means any savings resulting from these improvements are not currently accounted for in our estimates. Despite this uncertainty, over the last two decades the trend for GHG emissions in the agriculture sector is moving in the right direction. This is as a result of the reduced use of nitrogen fertilisers and a decline in overall livestock numbers, partly as a result of reforms to the Common Agricultural Policy.
3. Between 2009 and 2010 there was a **0.9%** increase in GHG emissions from agriculture. In the context of the longer term downward trend and wider uncertainty already discussed, this result is not in itself unduly worrying. This is because the result is only a limited increase over a single reporting year and does not indicate a change in the overall trend. We will however keep a close eye on progress to see whether this single year increase is the start of a change in the longer term, downward trend but at this stage, we view this isolated increase of limited significance.

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<sup>1</sup> Greenhouse Gas emissions are measured in units of carbon dioxide equivalent (CO<sub>2</sub>e)

<sup>2</sup> 95% confidence intervals (Source: National Inventory Report 2010)

- N<sub>2</sub>O (soils): **+249%, -93%**;
- N<sub>2</sub>O & CH<sub>4</sub> (manure management): **+/-25%**;
- CH<sub>4</sub> (enteric fermentation): **+/-16%**

4. In England, **nitrous oxide (N<sub>2</sub>O)** from the use of synthetic and organic fertilisers in soil nutrient management practices is the most significant source of GHG emissions from agriculture, accounting for 61%. **Methane (CH<sub>4</sub>)** from the ruminant digestion processes in livestock animals and the production and use of manure and slurry is the next most significant at 32%. Less than 10% of emissions are in the form of **carbon dioxide (CO<sub>2</sub>)** as energy used for fuel and heating. Despite the uncertainty associated with the agricultural GHG inventory, the root causes of emissions from agriculture are well understood and action can be taken now to address these.
5. The types of technology and farming practices used by farmers which are either directly or indirectly related to GHG emissions from agriculture are determined by a number of internal and external factors<sup>3</sup>. The policy landscape is one example of an external factor which influences the choices made by farmers. These policies include air quality, animal health and welfare, biodiversity and land management, climate change, soils and water quality. The Common Agricultural Policy cuts across all of these respective areas.
6. In England, the approach for reducing GHG emissions from agriculture includes a range of actions led by industry and government. The Greenhouse Gas Action Plan (GHGAP) is an industry led voluntary initiative being taken forward by an Industry Partnership consisting of 14 organisations. It outlines how GHG emission reductions could be delivered between now and the third carbon budget (2018 – 2022) through wider uptake of more resource efficient practices. Its ambition is to:
  - **Reduce annual GHG emissions from English agricultural production by 3 MtCO<sub>2</sub>e by the third carbon budget period (2018 – 2022), compared to a 2007 baseline**
7. Defra is not a partner of this voluntary approach however we are supportive of the leadership the industry is showing and we are taking actions to support its implementation. This includes investing £12.6m over four and a half years (in partnership with the devolved administrations) to improve the national agriculture GHG Inventory<sup>4</sup>. We are also continuing a wider research programme to develop the evidence base, mapping farm practices to policies and incentives to develop

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<sup>3</sup> Internal factors are typically related to knowledge, attitudes and habits whilst external factors include input and output price drivers, rules and regulation as well as environmental circumstances, locally and globally

<sup>4</sup> More information is provided in Paper 2: Research of this Report

a better understanding of the current policy framework<sup>5</sup> and establishing a monitoring and indicator framework<sup>6</sup> to transparently track progress made.

8. The 2012 review is a long standing commitment to review progress made in reducing GHG emissions from agriculture. As the GHGAP has only entered the second year of a ten year plan, the 2012 review is taking a long term perspective to develop a shared understanding of the evidence base in the context of developing policy options in the future as well as a framework for an ongoing assessment of progress.
9. With regard to the Devolved Administrations, it is notable that the mitigation methods recommended in Scotland, Wales and Northern Ireland, are very similar to those recommended in England. However, there is a more integrated approach to carbon storage and sequestration in agricultural climate change policy in the Devolved Administrations.

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<sup>5</sup> More information is provided in Paper 3: Analysis of this Report

<sup>6</sup> More information is provided in Paper 5: Indicator and Monitoring Framework of this Report

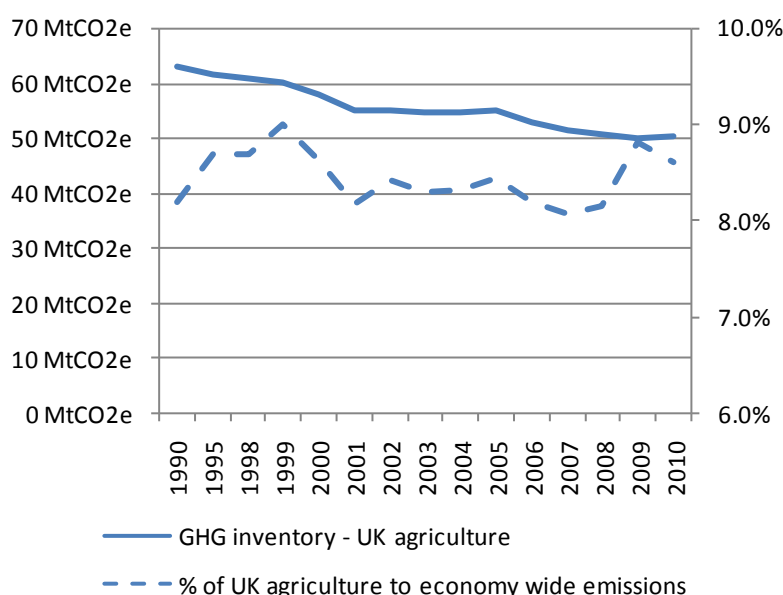
## Introduction

10. This background paper provides information on GHG emissions from agriculture, the current policy approach in England and the Devolved Administrations, as well as an overview of the scope of this 2012 review. The supporting annex contains the Terms of Reference for the 2012 review alongside a list of organisations who have participated in the review project.

## GHG emissions from agriculture

11. The Climate Change Act 2008 sets a legally binding commitment of at least an 80% cut in GHG emissions by 2050 measured against a 1990 baseline. To support progress towards achieving this ambition, a carbon budgeting system which caps GHG emissions over five year periods, has been established with the first three carbon budgets running from 2008 – 2012, 2013 – 2017 and 2018 – 2022. Carbon budgets cap GHG emissions from the overall ‘carbon’ economy but do not set targets for sectors as action to reduce GHG emissions is focused on areas where cost effective savings may be achieved. The level savings between sectors of the carbon economy will therefore vary to reflect the unique challenges and circumstances each face.

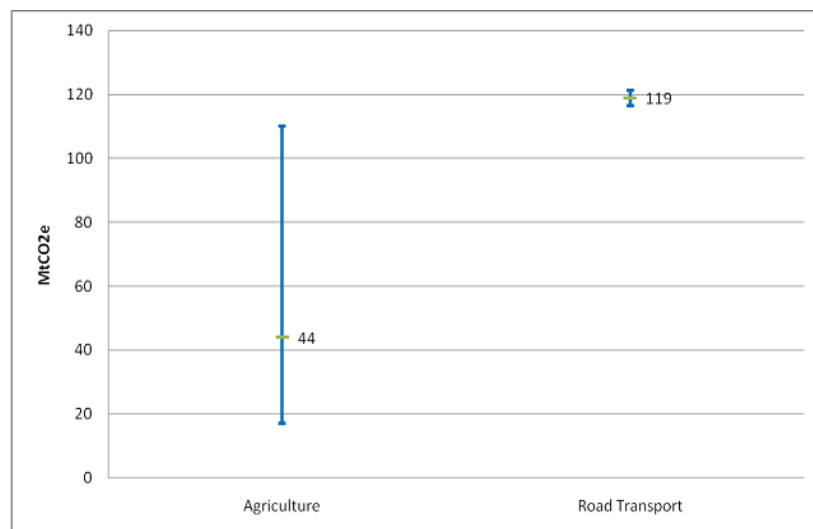
Figure 1: Agricultural GHG inventory (1990 – 2010)



12. It is estimated agriculture emits around **9%** of the UK’s GHG emissions. This is a significant proportion of the overall carbon economy. Because of the limitations in

the way we currently measure GHG emissions from agriculture, these estimates are uncertain. For example, current estimates do not fully reflect the positive actions farmers have already made to their farming practices. This means any savings resulting from these improvements are not currently accounted for in our estimates. Despite this uncertainty, over the last two decades the trend for GHG emissions in the agriculture sector is moving in the right direction. This is as a result of the reduced use of nitrogen fertilisers and a decline in overall livestock numbers, partly as a result of reforms to the Common Agricultural Policy.

Figure 2: Uncertainty estimates for emissions from agriculture and road transport (2008)



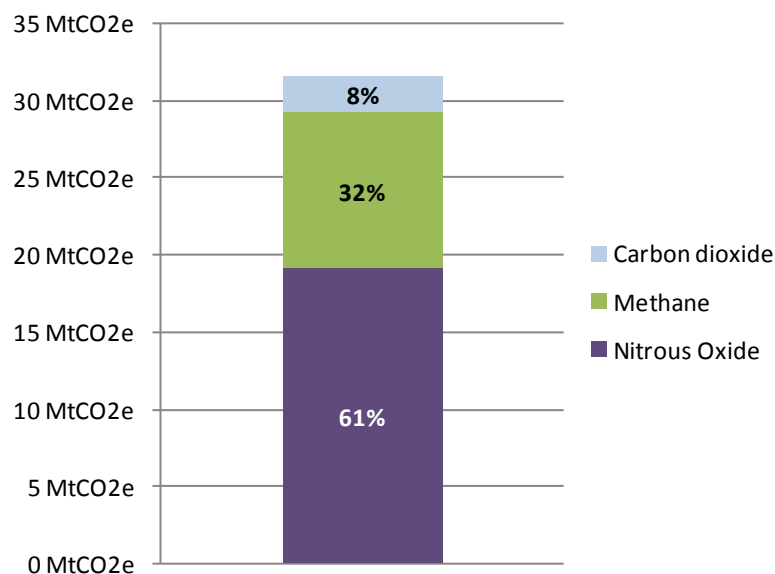
13. As discussed, our estimates of GHG emissions from agriculture are uncertain and do not fully reflect the actions farmers have already taken. The current agricultural GHG inventory uses a standard Intergovernmental Panel on Climate Change (IPCC) tier 1 methodology to calculate overall emissions from UK agriculture. The model is predominately based on the number of livestock animals and the amount of nitrogen based fertiliser applied, which are then multiplied by standard emission factors. Work is underway to improve the agricultural GHG inventory with Defra and the Devolved Administration Governments investing £12.6m in research to improve the emissions factors, structure of the inventory and use of farm activity data by 2014/15. Between then and now, it is important to recognise the limitations of the current inventory model.

14. Between 2009 and 2010 there was a **0.9%** increase in GHG emissions from agriculture. In the context of the longer term downward trend and wider uncertainty already discussed, this result is not in itself unduly worrying. This is because the result is only a limited increase over a single reporting year and

does not indicate a change in the overall trend. We will however keep a close eye on progress to see whether this single year increase is the start of a change in the longer term, downward trend but at this stage, we view this isolated increase of limited significance.

15. Agriculture is a devolved issue and in England and by source, nitrous oxide (N<sub>2</sub>O) emissions from the use of synthetic and organic fertilisers in soil nutrient management practices is the most significant source of GHG emissions from agriculture. A third of methane (CH<sub>4</sub>) emissions originate from the ruminant digestion processes in livestock animals and the production and use of manure and slurry. Less than 10% of agricultural GHG emissions are in the form of carbon dioxide (CO<sub>2</sub>), as energy is used for fuel and heating. Despite the uncertainty associated with the current agricultural GHG inventory, the root causes of emissions from agriculture are well understood and action can be taken now to address these.

Figure 3: By source, English agricultural GHG emissions (2010)



## Approach between now and the third carbon budget (2012 – 2022)

16. The types of technology and farming practices used by farmers which are either directly or indirectly related to GHG emissions from agriculture are determined by a number of internal and external factors. The policy landscape is one example of an external factor which influences the choices made by farmers. These policies

are often developed in response to a number of different policy objectives and policy areas which include (but is not excluded to):

- Air Quality
- Animal health and welfare<sup>7</sup>
- Biodiversity and land management<sup>8</sup>
- Climate change
- Soils
- Water Quality (including nitrates)

17. The Common Agricultural Policy cuts across all these policy areas. Figure 4 provides a high level view of this wider policy landscape. Focusing on the governance of agricultural production, it highlights over 10 international agreements and directives which are ultimately linked to domestic policies which influence the choices made by farmers on the types of technology and farming practice they use.

18. The diagram presents information from left to right with international policy and legislation presented to the left side of the diagram and more domestically focused legislation and implementation mechanisms to the right.

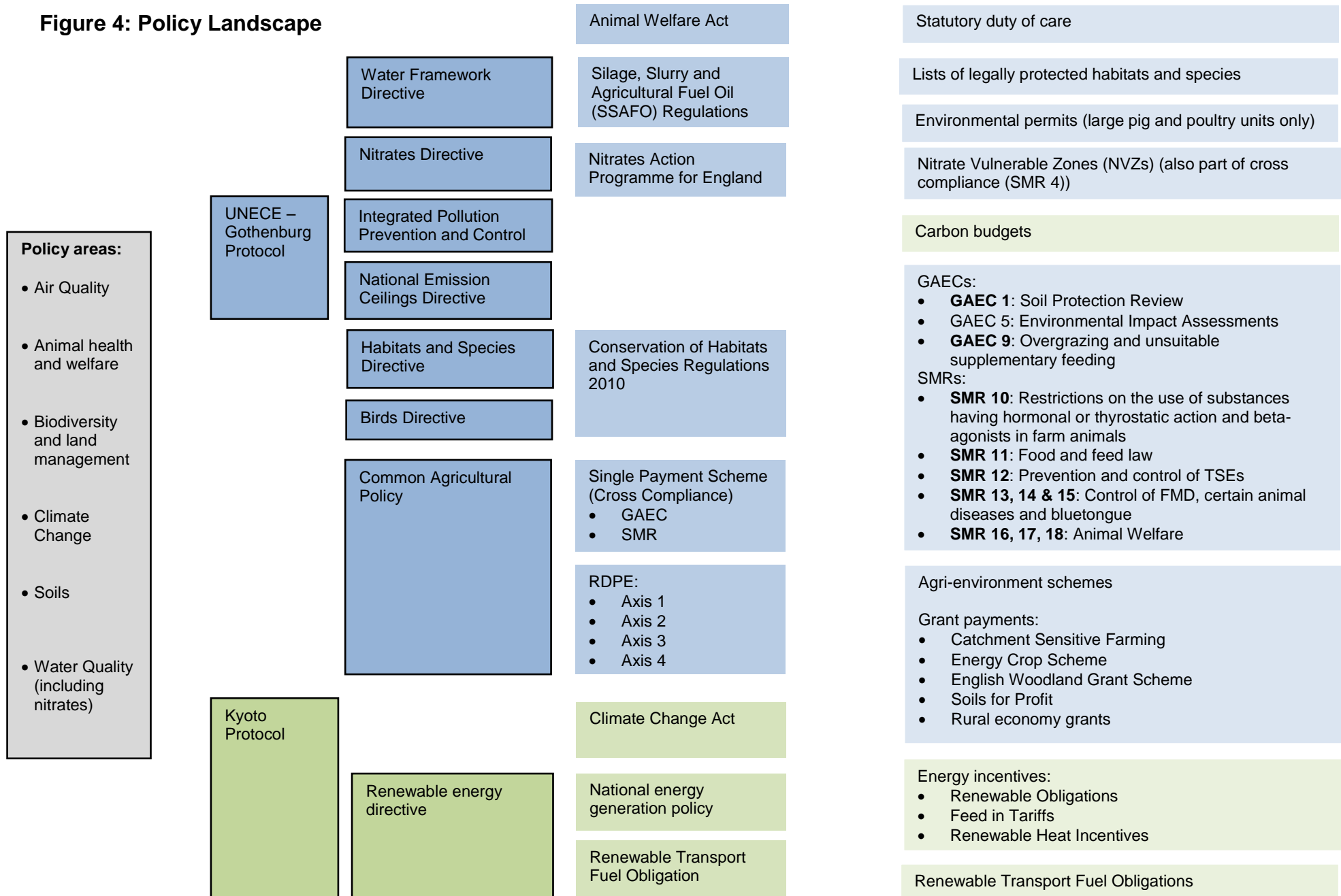
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<sup>7</sup> The analysis does not consider the multiple EU Directives relating to Animal Welfare rules and regulations, the majority of which are implemented via the Animal Welfare Act, the Common Agricultural Policy (CAP) and livestock disease prevention and control arrangements

<sup>8</sup> The analysis does not consider in depth, the impact of biodiversity and land management rules and regulations, which although influence the size and shape of agriculture, are less associated with the governance of agricultural production



**Figure 4: Policy Landscape**



19. In England, the direct approach for reducing GHG emissions from agriculture includes a range of actions led by industry and government.

20. The GHGAP is an industry led voluntary initiative being taken forward by an Industry Partnership consisting of 14 organisations. It outlines how GHG emission reductions could be delivered between now and the third carbon budget (2018 – 2022) through wider uptake of more resource efficient practices. It's ambition is to:

- **Reduce annual GHG emissions from English agricultural production by 3 MtCO<sub>2</sub>e by the third carbon budget period (2018 – 2022), compared to a 2007 baseline**

21. Defra is not a partner of this voluntary approach, however, we are supportive of the leadership the industry is showing and we are taking actions to support its implementation. These actions include:

- Improving the national agriculture GHG inventory, through the investment of £12.6m over four and a half years, in partnership with the devolved administrations, in a series of projects aimed at strengthening our understanding of GHG emissions produced on farms. This work will help to identify the steps which can be taken to reduce emissions as well as capturing existing activity
- Investing in a wider programme of research, identifying new and novel things farmers can do to reduce emissions. For example, improving nutrient use through better feed management, optimising lifetime protein use for milk production and understanding the impact and cost effectiveness of tackling endemic disease in cattle
- Engaging in partnership with Research Councils and through the Technology Strategy Board and internationally through the Global Research Alliance to promote exchange of data, training and research to help improve how agricultural GHG research is conducted and enhance scientific capability
- Including climate change mitigation as a topic of advice under the Farm Advisory Service contract during 2012 and 2013
- Completing Natural Environment White Paper and Defra Business Plan commitments<sup>9</sup> to review the use of voluntary approaches, advice and incentives for farmers and land managers, to create a more integrated, streamlined and efficient approach that is clear and can yield better environmental results
- Develop understanding of the role of Defra policies in encouraging farmers to adopt farm practices which can reduce GHG emissions and establish a monitoring and indicator framework to transparently track progress made

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<sup>9</sup> Defra Business Plan Action 3.ii

## The 2012 Review

22. In responding to the 2<sup>nd</sup> Annual Report of the Committee on Climate Change (CCC) in October 2010, the Government reiterated its commitment to review in 2012 the progress made under the industry-led GHGAP. Since then, it has become increasingly clear that it was important to review how the whole policy approach is geared towards helping achieve reductions in GHG emissions from agriculture.
23. This broader view would also need to take a longer term approach due to uncertainty in the current evidence base and the fact that the GHGAP was entering the second year of a ten year plan meaning it would be too early to fairly evaluate the overall impact of the current approach. Given the complexity, uncertainty and early stage of the current approach, it was proposed to seek the views of experts and interested organisations to gain a better shared understanding of the evidence base in the context of developing policy options in the future.
24. On 1 November 2011, Defra facilitated an informal discussion with external stakeholders to consider the proposed terms of reference for the review, the range of evidence available and the priorities for future analysis. This discussion confirmed our intended approach of taking a longer term perspective and the need to develop a framework for assessing progress on a regular basis. The comments made during the discussion also suggested that there was a significant level of agreement that, rather than concentrating on estimating emissions reductions to date, it would be helpful to gain a better understanding of the impact of other policies and incentives on agricultural GHG emissions.
25. The Terms of Reference agreed following this informal discussion are provided in annex A. The associated programme of work for the period to November 2012 included:
- analysis of new data from the Farm Practices Survey, British Survey of Fertiliser Practice and any other relevant climate and agriculture information
  - review of the early findings of current research projects (including the inventory improvement work)
  - review of progress on the industry-led GHGAP and industry's sector-specific product roadmaps
  - development of a longer term evaluation framework, including performance indicators, and
  - mapping farm practices to policies and incentives.
26. On 9 February 2012, a workshop facilitated by Defra provided participating organisations with an overview of the research programme and an opportunity to challenge and influence the early stages of the mapping and evaluation projects.

27. A list of organisations invited to participate in the review is at annex B. While the degree of involvement possible has in some cases been limited by the many other demands on the resources of these organisations, Defra acknowledges with gratitude the time, comments and expertise provided by these organisations in contributing towards the Review's conclusions.

## Approaches taken by the Devolved Administrations

28. Agriculture is a devolved matter within the UK, with each of the devolved administrations (DA) adopting a different policy approach. The proportion of GHG emissions from agriculture varies in each DA, reflecting the relative size of agriculture in comparison to other sectors. Although the 2012 Review specifically focuses on GHG emission reductions in English agriculture and does not aim to evaluate policies within the DAs, officials from the relevant Departments in Scotland, Wales and Northern Ireland were invited to participate in the review in order to share any lessons learned.

29. While there are differences in the approaches taken, which may in part reflect the different landscape and geographical circumstances in each country, it is notable that the overall themes and recommended mitigation methods for reducing emissions on-farm are very similar in all four countries. In each case, farmers are encouraged to optimise the use of fertilisers and manures, look at efficiencies in livestock management and consider opportunities to adopt renewable energy.

30. A significant difference between the approaches taken in Scotland, Wales and Northern Ireland in comparison to that in England is the treatment of carbon storage and sequestration. In England, the 2012 review and to an extent the GHGAP focuses predominantly on emissions from agricultural production. Initiatives currently being implemented in the other DAs all seek to integrate methods designed to lock carbon into soil, vegetation and woodland, creating 'carbon sinks'. This more integrated approach has been highlighted by many stakeholders throughout the 2012 Review process and has been recognised in other Defra reviews too.

31. The box provides a brief overview of the current approach to climate change mitigation in the DAs.

### Scotland

- i. Agriculture and related land use currently account for 19% (10.5 MtCO<sub>2</sub>e) of **Scotland's total GHG emissions in 2010 (note this includes ~ 2.5 Mt CO<sub>2</sub>e of net CO<sub>2</sub> emissions from agricultural land use – such emissions are not currently accounted for in the agriculture inventory in England)**. Agricultural production accounted for 12.8% of Scotland's GHG

emissions in 2010.

- ii. The Climate Change (Scotland) Act<sup>10</sup> sets statutory targets to reduce GHG emissions across the economy by 42% by 2020, and 80% by 2050.
- iii. **Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022**, published on March 14, 2011, describes the mitigation methods identified to meet the emissions reduction targets established by the Climate Change (Scotland) Act 2009, over the period 2010-2022. The publication sets out the ambition for emission reduction in agriculture and related land use.
- iv. The Scottish Government's approach is to begin by seeking the maximum voluntary uptake of win-win actions which both reduce emissions and improve farm performance – like optimising the use of artificial fertiliser. The key vehicle to deliver advice to farmers is the **Farming for a Better Climate**<sup>11</sup> initiative. Depending on the progress achieved, Scotland will then consider whether regulatory measures are also needed. Emissions reductions will be considered in absolute terms, but also in the context of emissions per unit of food produced.
- v. In 2013, the Scottish Government will publish a statutory report setting out emission reduction proposals for the period 2023-2027.

## Wales

- vi. Agriculture and land use currently accounts for 12% of Wales GHG emissions in 2010.
- vii. The Welsh Government hopes to achieve a 10% reduction by 2020 and also has an annual 3% emissions reduction target across all sectors which fall into areas of devolved competence.
- viii. The main drivers for delivering Welsh policy are in the 'Climate Change Strategy for Wales'<sup>12</sup>, the first annual progress report of which was published at the end of March 2012, and 'The Report of Land Use Climate Change Group'<sup>13</sup>.

## Northern Ireland

- ix. Agriculture currently accounts for 26% of Northern Ireland's GHG emissions in 2010. NI exports the majority of its output.

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<sup>10</sup> <http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact>

<sup>11</sup> [www.farmingforabetterclimate.org](http://www.farmingforabetterclimate.org)

<sup>12</sup> <http://wales.gov.uk/topics/environmentcountryside/climatechange/publications/firstprogressreport/?lang=en>

<sup>13</sup> <http://wales.gov.uk/docs/drah/publications/110214lucggLreport%20finalv2.pdf>

- x. Along with industry bodies the Dept. of Agriculture and Rural Development formed an Agriculture and Forestry GHG Stakeholder Group, which produced a GHG Reduction Strategy and Action Plan in 2011 – ‘Efficient Farming Cuts GHGs<sup>14</sup>’. The key objective of the strategy is to promote the adoption of a programme of technical efficiency measures on-farm that will lead to improved business performance and help reduce GHG emissions.
- xi. The GHG Stakeholder Group aims are to reduce emissions per unit of commodity output and have a robust measurement methodology for milk production on which to base targets for reduction by 2013. The Northern Ireland Executive has set an all sector reduction target of 35% by 2025.

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<sup>14</sup> <http://www.dardni.gov.uk/publications-environment-efficient-ghg-report>

## Annex A

Department for Environment, Food and Rural Affairs

10th February 2012

### **Terms of Reference – review of progress towards reducing GHG emissions from agriculture in 2012**

#### **Aim**

1. The aim of the 2012 review:

- By no later than November 2012, assess the effectiveness of Government's current approach to achieving Greenhouse Gas (GHG) emissions reductions from agriculture

#### **Commitments**

2. The 2012 review will achieve Defra's Business Plan Action 1.5.ii

- *'Review progress towards reducing greenhouse gas emissions from agriculture (End, November 2012)'*.

3. The 2012 review will also contribute towards and draw on the findings of the Natural Environment White Paper Commitment (paragraph 2.48)

- *'to assess more generally the effectiveness of this kind of voluntary industry-wide approach'*.

#### **Scope**

4. In scope for the 2012 review:

- The way in which the current policy landscape on agriculture may drive reductions in GHG emissions now and in the future;
- The evidence base on GHG emissions and abatement potential in agriculture as well as likely future trends affecting GHG emissions;
- The progress made by the industry led GHG Action Plan & sector road maps in enabling the agricultural industry to reduce greenhouse gas emissions; and
- Any practical lessons learned by devolved administrations in achieving GHG emissions abatement within the agriculture sector.

5. Out of scope for the 2012 review:

- Policy tailored for the agricultural supply chain, food supply chain and consumption of agricultural products;
- The efficacy of voluntary approaches in general (i.e. the review will only assess the impact of the GHG Action Plan & sector road maps – which will feed into and draw on the findings of the wider review of voluntary approaches);

### **Interfaces**

6. The 2012 review will work closely with the teams taking forward the Integrated Advice Pilot Project and the GHG inventory improvement work - two policy initiatives aimed at providing the agricultural sector with better information on GHG emissions. The review will also engage with the industry via progress reports on phase 1 and discussions on the development of phase 2 of the action plan.
7. The 2012 review will also draw on policy and evidence programmes in Defra as well as working closely with other Government Departments and external organisations.

### **Outputs and milestones**

8. The outputs of the 2012 review will include:
  - A workshop (Early 2012)
  - Initial report with ministers (Spring 2012)
  - A document reporting the findings of the review to include: a summary of the evidence base, analysis of the effects of policy to date and recommendations for a future evaluation framework (Late 2012)



## Annex B

### Stakeholder list

- Agricultural Industries Confederation (AIC)
- British Pig Executive (BPEX)
- British Poultry
- Committee on Climate Change (CCC)
- Country Land and Business Association (CLA)
- Dairy Co
- English Beef and Lamb Executive (EBLEX)
- Friends of the Earth
- Home Grown Cereals Authority (HGCA)
- National Trust
- National Farmers Union (NFU)
- Royal Society for the Protection of Birds (RSPB)
- Soils Association
- World Wide Fund for Nature (WWF)

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