

Department for Environment, Food and Rural Affairs

Paper 2: Research

November 2012

Contents

Summary and key messages	1
Introduction	3
Overview of key research projects	4
Future challenges.....	10
Annex – Current Position on Research Supporting Abatement Options	14

Summary and key messages

1. The Greenhouse Gas (GHG) research platform is a key £12.6m, four and a half year project aimed at improving the accounting structure for GHG emissions from agriculture. Implemented in partnership with the devolved administrations, it is expected to provide a more robust framework to monitor GHG emissions from agriculture.
2. Although it is too early to begin drawing emerging findings from the GHG research platform, the project continues to progress well and remains on track to complete as scheduled in 2014/15.
3. Alongside this work, Defra is also investing in research to better understand the impact of the Greenhouse Gas Action Plan (GHGAP) on farming and the environment. Research project AC0227 is currently tracking the experience of 15 case study farmers across a range of business types and geographic situations as they implement practical mitigation plans for their businesses. Some of the early findings from this study include:
 - Most farmers included in the study are very progressive in terms of implementing mitigation methods and are not necessarily typical of the norm
 - Many case study farms have completed the standard mitigation actions proposed as part of everyday business practice
 - Some are looking to expand mitigation actions, as extensions of business efficiencies
4. Research project AC0226 is more focused on understanding the wider impacts of the GHGAP on wider environmental objectives. This research is scheduled to complete soon and should help to identify potential co-benefits or trade-offs associated with the current approach. The research will also suggest ways in which any negative outcomes can be effectively managed.
5. Looking ahead to future challenges, Defra has identified it could do better at exchanging the findings of its research projects with external stakeholders. To improve the link between Defra's research and external stakeholders, particularly the Industry Partnership, which is focused on developing and implementing the GHGAP, Defra is:
 - Trialling a mailing list providing interested parties with a list of current and recently completed Defra sponsored research projects, and
 - Organise regular knowledge exchange events facilitated by Defra in the space of agriculture and GHG emissions

6. Throughout the 2012 Review we heard feedback from stakeholders that the role of land management in storing carbon should be reviewed. As the core remit of the review was to assess progress made in reducing GHG emissions from agriculture, we prioritised the role of production and the steps taken to deliver reductions to date. In the future, however, it is our intention to develop the evidence and tools produced by this review to take into account wider land management practices and their associated impact on carbon storage. For example, we are looking to work with experts to develop the FARMSCOPER Upscaling Tool to include new practices which relate to carbon storage, as well as filling gaps in the current modelling framework on the production side too.
7. Internationally, Defra continues to actively engage with multiple organisations to boost knowledge exchange. This is to ensure the UK maintains a competitive sector producing food with fewer units of associated GHG emissions as well as providing a knowledge base of technology and mitigation methods which might be exported to other countries.

Introduction

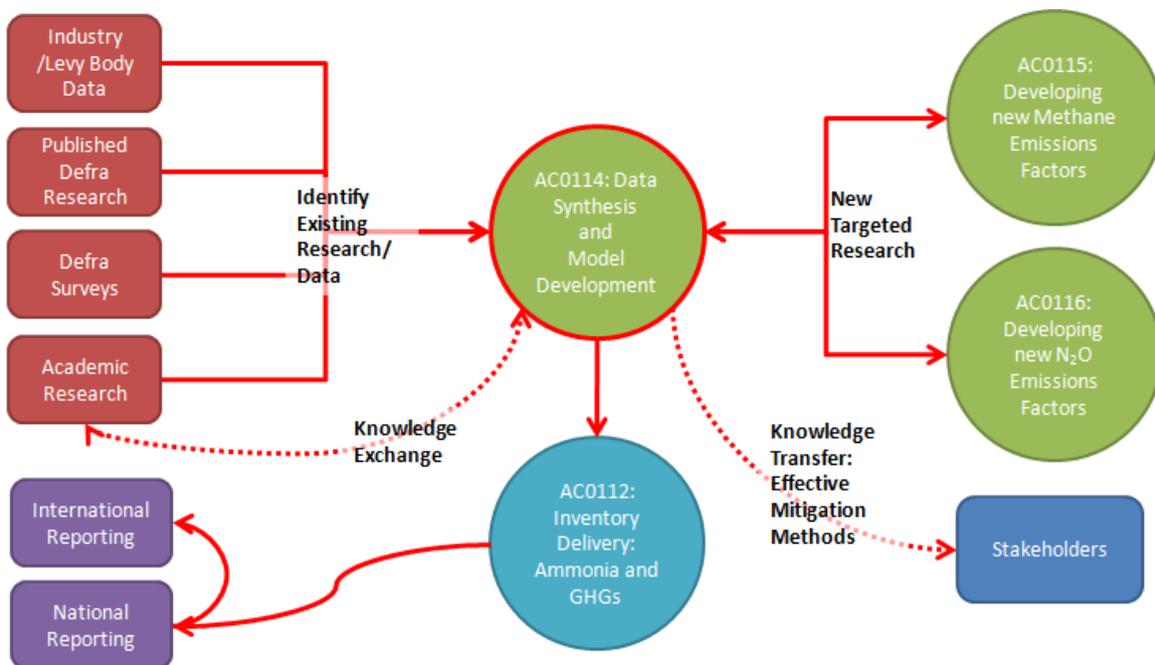
8. This paper provides an overview of efforts underway to improve Defra's evidence base on GHG emissions from agriculture. It includes information on current research projects and progress, as well as outlining some of the future challenges for our evidence base moving into the future. The supporting annexes include a list of research projects that are currently ongoing or have recently completed, and our current position on research supporting GHG emission reduction options.
9. Future research focused on reducing GHG emissions from agriculture will be included in an Evidence Plan incorporating the evidence needs of the Sustainable and Competitive Farming Strategy (SCFS) Team. The principle objective of SCFS is to improve the economic and environmental performance of agriculture so that the productivity and competitiveness of farming businesses are enhanced together with improved environmental outcomes. The research priorities outlined in the Evidence Plan will support the business outcomes required of the SCFS team in contributing to this overarching goal and are divided into three main areas:
 - i. Bringing more farms up to current best practice in terms of competitiveness and environmental outcomes
 - ii. Improving best practice over time, through the use of new technologies to improve competitiveness and environmental benefits simultaneously
 - iii. Achieving an optimum balance between production and the range of ecosystem services delivered through agricultural practices
10. Research and evidence development for reducing GHG emissions from agriculture are also focussed on sharing international knowledge on food security, GHG emissions and Climate Change adaptation. There is a particular focus on research regarding cost effective new technologies such as earth observation techniques and innovative farming practices such as precision farming. We are also looking to develop our understanding of the wider environmental performance of different farming systems using R&D farm platforms and engaging with champion farmers to boost knowledge exchange.

Overview of key research projects

Greenhouse Gas Research Platform

11. The GHG research platform is a key four and a half year project aimed at improving the accounting structure for GHG emissions from agriculture. Investing £12.6m, Defra and the devolved administration governments are working with 16 agri-science institutes and over 100 scientists, to improve the information we are able to report publicly and submit to international organisations such as the UNFCCC. Scheduled to complete in 2014/15, the work is expected to provide a more robust reporting inventory which is representative of the UK farming sector, taking into account the impact of farm efficiency practices. It is hoped this work will support efforts to reduce the uncertainty in emission estimates, a significant issue with the current agricultural inventory.
12. This Platform is not only important to meet the elevated importance of national and international reporting of GHG emissions from agriculture following the implementation of the Climate Change Act 2008. It will also provide a valuable, more transparent process for monitoring agriculture's progress in reducing overall GHG emissions through the industry's GHGAP and will highlight effective mitigation methods.

Figure 1: Diagram of the GHG Research Platform



13. The work of the GHG research platform is focused on:

- Reviewing the existing evidence and data sets to ensure that the inventory reflects the current state of science

- Revising the current inventory model to better reflect the structure of the UK agricultural sector and the geographic distribution of soils and climate. The model will be more focused on specific sectors and will have significantly improved spatial and temporal resolution
- Generating new emissions factors for systems where existing measurements are poor or non-existent through targeted experiments
- Ensuring that the revised inventory is capable of reflecting on farm efficiency practices that are relevant to the systems represented in the model

14. This work is structured under a single research platform comprising of three projects:

- AC0114 - Data synthesis and modelling
- AC0115 - Targeted measurements of methane from ruminant livestock
- AC0116 - Targeted measurements of nitrous oxide from UK soils

15. A number of satellite projects running in parallel will build upon the main platform work and include field trials of nitrification inhibitors in project AC0213, and industry co-funded measurements of emissions from arable crops and products (MinNO).

16. The challenge of the GHG Research Platform is not just one of improving the inventory model's structure and developing emission factors more relevant to the UK. The wider challenge is in identifying, improving and ensuring read across from different farm activity data sources so that they can be combined with the new emission factors to derive annual estimates of agricultural GHG emissions. As the inventory becomes more complex, activity data requirements will increase.

17. To this end, Platform modellers are working closely with Defra's statistics team to broaden existing statistical data collection tools such as the British Survey of Fertiliser Practice to ensure changes in critical activities on farm are adequately captured. The GHG Platform team have also posed additional questions for inclusion in the Farm Practice Survey and Farm Business Survey to improve our understanding of other farm practices that impact on GHG emissions.

Table 1: List of key milestones for the GHG Research Platform

Milestone	Start Date	End Date
Prioritisation Phase and Experimental Launch	01/11/2010	01/07/2011
Design Options for New Inventory	01/04/2011	31/12/2011
Field Measurements and Evidence Collection	01/11/2011	01/07/2012
Mitigation Effects Presented	01/06/2012	31/12/2012
Recommendations for Inventory Design	01/01/2013	01/07/2013
Methane Measurements Complete	01/07/2013	01/12/2013
Interim Methane Results	01/01/2014	01/07/2014
Interim Nitrous Oxide Results	01/01/2014	01/12/2014
New Inventory Functional	01/06/2014	01/02/2015
Inventory Complete	01/06/2015	01/12/2015

18. Experimental work to underpin the revised inventory is now in its second year of three. Given the wide variation in GHG emissions from year to year and across regions, a large number of trials and replications are required to adequately quantify typical emissions from the principal livestock and arable cropping systems. As such, it is too early to present specific results with any confidence. However, we expect peer reviewed experimental data to be published in 2014. The next annual stakeholder event to present emerging findings will take place in spring 2013.
19. The scope of the new inventory has now been circulated to policy teams and stakeholders across the UK and responses are being processed. Recommendations on its design should be completed by July 2013. From then on the models will increasingly be populated with new GHG emission factors and farm activity data as they become available and comparisons made with the existing inventory to highlight differences as the sophistication of measurements increases from IPCC Tier 1 (using international default emission factors) to Tiers 2 & 3 (more UK specific). The proposed date for introduction of the new inventory, subject to acceptance of the changes by the UNFCCC Expert Review Team, is 2015 (using data from the 2013 emissions year) to align with the establishment of the baseline for the next Kyoto reporting period.
20. Further work is still required to clarify how much of the industry activity in the Action Plans can be captured within the inventory and whether the inventory work can highlight any additional cost effective practices that industry can pick up. Annual stakeholder workshops are facilitating this and the GHG platform team continue to work closely with industry. Whilst the inventory develops we will continue to report the UKs official agricultural emissions using the existing tier 1 model, and track the implied changes that improvements bring over time by running the evolving revised inventory over the next 2 to 3 years. Once the programme of improvements is complete we will

implement the final improved model for the 2015 submission to avoid any confusion with continually fluctuating emissions estimates as the model evolves.

21. Overall, work on the research platform is progressing well. Stakeholder consultation workshops have been held, and valuable feedback from the industry and stakeholder groups has been taken into account. Such levels of multidisciplinary, collaborative working are genuinely novel, and the work has highlighted some exciting potential mitigation options. It is currently too early to comment on specific options, as further work is required to confirm these initial results. However, as the evidence base grows news stories will periodically appear on the platform website¹.

The wider farming and environmental impacts of the GHGAP

22. Defra is also investing in research to better understand the impact of the GHGAP on farm businesses and the environment.

Table 2: List of research projects testing the impact of the GHGAP

Project code	Project title	Scheduled completion date
AC0222	Feasibility of GHG mitigation methods	Complete
AC0226	Quantifying, monitoring and minimising wider impacts of GHG mitigation measures	2013
AC0227	Case studies of mitigation method interaction	2013

23. Research project AC0222 completed in 2010 examined the feasibility of a set of key mitigation measures for farmers including an analysis of barriers and hidden costs. It concluded that there is a low understanding by farmers of the importance of nitrous oxide in GHG emissions from agriculture. This is despite the identification of the use of clover in grass leys and the use of low nitrogen use crops as providing some of the largest opportunities for reducing nitrous oxide emissions from farms. To implement these mitigation methods effectively does require the development of markets for low nitrogen use crops. More reliable breeding information is also needed for another significant mitigation method – improved livestock breeding.

24. The report highlights economic and regulatory drivers as tools which can influence the largest uptake of mitigation methods. For example the requirement for fertiliser

¹ www.GHGplatform.org.uk

spreader calibration for arable crop assurance schemes, or practices which have a positive impact on farm incomes. Increasing awareness, acknowledging the value of experience and local evidence of successful application are also important considerations which can encourage increased uptake. There is, therefore, a clear role for the GHGAP to promote the challenge of reducing GHG emissions from agriculture, developing improved information for farmers in the context of farm efficiency and wider regulatory requirements from assurance schemes specified by the food supply chain and wider Government regulation.

25. Research project AC0227 is tracking the experience of 15 case study farmers across a range of business types and geographic situations as they implement practical mitigation plans for their businesses. The project is tracking the impact these plans have on farm incomes and a range of environmental indicators relating to GHG emissions, water and air pollution. It is also recording farmers' perceptions of mitigation methods and the action plan throughout the lifetime of the project to achieve a better understanding of potential barriers or difficulties farmers face.

26. The objectives of project AC0227 are to:

- Select appropriate farms for case study analysis and agree a mitigation plan for each. A mitigation plan is a suite of methods appropriate for that farm, based on specific actions in the User Guide (WQ0106) and the GHGAP, focusing on nitrous oxide and methane emissions
- Collect real data from these farms to allow quantification of mitigation potential and analysis of the actual environmental and economic impacts of adoption of the mitigation plans and understand the practical and motivational issues.

27. The mitigation plans developed with the farmers were drawn from an initial list based on recommendations in the industry led GHG Action Plan. There are few results from the project so far although some early findings indicate the following:

- **Most case study farmers are very progressive in terms of implementing mitigation methods and are not necessarily typical of the norm**
- Typically these case study farms have average to high profitability and take a proactive approach to business, including looking for new business opportunities. Most thought that it was important to reduce GHG emissions but feedback suggests that mitigation methods have not generally been implemented with GHG reductions as the main motivation.
- **Many case study farms have completed the standard mitigation actions proposed as part of everyday business practice**
- Many case study farmers have been implementing GHG mitigation actions on their farms for a number of years which is seen as good business practice, rather than an effort to reduce GHG impacts and not necessarily recognising it as such.

- **Some are looking to expand mitigation actions, as extensions of business efficiencies**

- Whilst some case study farmers have extended mitigation methods (such as the area of nitrogen fixing crops) as part of this project, others have expanded mitigation actions beyond that which is detailed in the GHGAP. These have usually been prompted by a desire to drive further resource efficiency in the business and/or motivated by ongoing R&D activities with other bodies or end retailers.

28. It is recognised that on farm actions being encouraged by Government through the industry GHGAP to improve efficiency of production and reduce GHG emissions may have potential impacts on other important desirable outcomes from farming which have not been adequately quantified especially those associated with the delivery of public goods and ecosystem services.

29. Whilst win-win outcomes appear to result for a range of environmental issues, we have less clear cut information, for example, about the potential agronomic, and biodiversity impacts. It is likely that improved nutrient efficiency will confer production benefits, but these interactions have yet to be examined in any detail. Similarly, some practices may positively or negatively impact on product quality, welfare standards and biodiversity. For example, some farming systems may trade-off increased efficiency of production and GHG emissions for reduced habitat quality or quantity, with implications for biodiversity.

30. In an attempt to quantify and model these interactions, research has been commissioned (AC0226) to establish the net environmental and social benefit of measures designed to reduce GHG emissions and the net ecosystem service value of the industry GHGAP. It is too early to report any emerging findings from this research project but it is expected to complete in the winter.

Lifecycle analysis of endemic diseases on GHG emissions

31. There is broad consensus among experts that productivity gains derived from improved cattle health offer great potential to achieve reductions in GHG emissions from livestock farming at a national level.

32. Research project AC0120 is a multidisciplinary project modelling the impact of controlling selected endemic cattle diseases and conditions on cattle productivity in Great Britain, agricultural performance and GHG emissions. Data for each sub-sector (dairy, suckler beef and beef finisher) and for each of the Devolved Administrations of Great Britain (England, Wales and Scotland) are being gathered and used to develop Marginal Abatement Cost Curves which will help identify the most cost effective interventions likely to result in increased productivity and reduced GHG emissions.

33. New and improved data on impact and prevalence have so far been gathered for four out of the ten conditions under investigation. Some of the preliminary results of the

study suggest that treating lameness for example, is a cost effective practice for reducing GHG emissions and improving productivity in the national herd.

Future challenges

Knowledge Exchange

34. Knowledge exchange is key to extract the most value from research supporting efforts to develop a sustainable and competitive farming sector. As set out in this review's mid-year report, Defra identified it could do better at exchanging the findings of research projects with external stakeholders, particularly the Industry Partnership who are focused on developing and implementing the GHGAP. Defra accepts the need to explore how the evidence base can be better communicated to interested actors to ensure the best, most up to date evidence is available – essential for setting the right conditions for innovation and creativity.
35. Defra is now trailing a simple mailing list providing external stakeholders including representatives of the GHGAP with a list of current and recently completed Defra sponsored research projects. This mailing list is intended to improve the bridge of information on important and insightful research between Defra and interested actors.
36. Of course, more can be done to improve knowledge exchange so alongside our trial of an external mailing list, we also intend to organise regular knowledge exchange events facilitated by Defra. Similar in format to those which take place on the GHG research platform, these knowledge exchange events might provide a forum for showcasing and debating not just Defra funded research, but projects funded by other organisations too.

Carbon storage and land management

37. Throughout the 2012 Review we heard feedback from stakeholders that the role of land management in storing carbon should be reviewed. As the core remit of the review was to assess progress made in reducing GHG emissions from agriculture, we prioritised the role of production and the steps taken to deliver reductions to date. In the future, however, it is our intention to develop the evidence and tools produced by this review to take into account wider land management practices and their associated impact on carbon storage.
38. As with the agricultural GHG inventory, there is uncertainty about the degree to which land management practices can contribute to a net reduction in carbon emissions. For example, the restoration of peatlands drained for agricultural use may present some opportunities for climate change mitigation, although in some cases rewetting of drained peats may actually increase overall emissions.
39. Other land management options may lead to increases in soil carbon, but these do not necessarily constitute meaningful mitigation, as increases in soil carbon in one location

may be achieved at the expense of losses of carbon in other locations, either through diversion of organic materials, or potentially through direct or indirect land use change. Where increases in soil carbon are achieved, the amounts of carbon sequestered per hectare are generally very small in comparison to anthropogenic emissions, and therefore rely on extensive implementation to achieve significant impact. The increased store of carbon is therefore vulnerable to management change, as any carbon captured is rapidly lost if management reverts to previous practice. The stability of sequestered carbon under climate change is also unclear. For these reasons, many scientists regard land management as having limited potential to mitigate climate change in the UK context.

40. Defra is developing our understanding of this complex issue further through the soil research programme. A number of projects relevant to this agenda are listed below:

- **SP1202:** Investigation of peatland restoration (grip blocking) techniques to achieve best outcomes for methane and GHG emissions / balance
- **SP1210:** Lowland peatland systems in England and Wales – evaluating GHG fluxes and carbon balances
- **SP1205:** GHG emissions associated with non gaseous losses of carbon – fate of particulate and dissolved carbon
- **SP1105:** Scoping study to determine feasibility of populating the land use component of the LULUCF GHG inventory
- **SP1113:** Capturing cropland and grassland management impacts on soil carbon in the UK LULUCF inventory

41. This research also plays a significant role in informing the commitment to ensure that soils remain in a condition where they are able to sustain the vital ecosystem services that will be required in future². By 2014 we will have a much clearer view on the impacts of land management on soil emissions and by 2015 we will have a much better disaggregation of how farming systems influence emissions.

42. However, for the purpose of international inventory reporting, land use, land use change and forestry (LULUCF) emissions are currently treated separately from agriculture for the UK as a whole. For example, the LULUCF inventory reports on soil carbon losses from drained English fenland soils, and accounts for soil carbon losses or gains associated with changes in land use (e.g. ploughing grassland for arable

² For example, Defra research project SP1106 Studies to explore greenhouse gas emissions and mitigation has shown which practices in the Soil Protection Review 2010 (SPR) can play a positive role in maintaining soil organic matter levels and where possible increasing them.

conversion)³. At present, emissions from land management are poorly captured by the UK's LULUCF inventory, but efforts are ongoing to address this through a project (beginning in 2012) to assess land management impacts on soil carbon.

43. A number of those we have consulted during the review have advocated a more integrated approach. It has been argued that we should look at agriculture and land management practices together, so as to take a view on how to reduce GHG emissions from these sectors most sustainably. This approach is already being taken in Northern Ireland, Scotland and Wales, though influenced by the specific landscape circumstances in each of these countries⁴. An integrated approach was also reflected in the conclusions of the Green Food Project. Therefore in spite of the current scientific doubts about the carbon reduction benefits of land management practices in the UK context, we will consider how they can in future be incorporated into our analysis in accordance with developing IPCC guidance on inventory compilation.

International context

44. GHG mitigation is a global challenge requiring global action, primarily through the United Nations Framework Convention on Climate Change (UNFCCC) and close collaboration on the science of methane and nitrous oxide emissions from different types of agricultural systems. Although UK agriculture contributes around 9% to national greenhouse gas emissions, it contributes less than 0.1% of total global emissions from agriculture. The UK can however have a large impact globally by using domestic agriculture to develop world class technologies in measuring emissions and internationally recognised methodologies for GHG reductions emission. This work can develop and help to ensure a competitive sector producing food with fewer units of associated GHG emissions as well as providing a knowledge base of technology and mitigation methods which might be exported to other countries.

45. For these reasons, and to add value to our own research effort through collaboration with international GHG science institutes, Defra is actively participating in the Global Research Alliance (GRA) on agricultural GHG emissions, a New Zealand initiative supported by 33 nations including USA, Brazil and China. UK scientists are involved in a variety of collaborative actions in the Livestock and Croplands Research Groups and both the Inventories & Measurements and the Carbon and Nitrogen Cross-Cutting Research Groups. The UK leads on three actions, for example on the synergy between reducing endemic disease in livestock and reducing GHG emissions and in developing a global network of modellers to categorise and develop carbon and nitrogen cycling

³ Around 8% of the total emissions from agricultural activity arise from land use, land use change or forestry, largely due to carbon losses associated with croplands, which are estimated to exceed the sequestration provided by grasslands. Emissions of methane and nitrous oxide from on farm practices account for 84%. The remaining 8% is associated with agricultural fuel and energy use.

⁴ An overview of the approaches taken by Scotland, Wales and Northern Ireland is provided in Paper 1: Background of this Review

models specific to various agricultural systems . Defra also maintains an interest in the Global Methane Initiative (GMI), on which DECC leads for the UK.

46. Bilaterally, the UK-China Sustainable Agriculture Innovation Network (SAIN), primarily funded by Defra and the Chinese Ministry of Agriculture (MoA) has a strong climate change focus. Research projects include mitigation methods for agriculture and water / improved nutrient management in agriculture; and estimates of future agricultural greenhouse gas emissions and mitigation methods in China.
47. At European regional level, Defra is fully engaged in the UK / France led Joint Programming Initiative on Food Security, Agriculture and Climate Change (JPI-FACCE) which brings together funders to add value to national research programmes and co-ordinate European regional action, notably in the field of GHG mitigation research.

Annex – Current Position on Research Supporting Abatement Options

<p>Avoiding unacceptable consequences</p>	<p>Project (AC0226) to assess wider implications of GHGAP measures currently being tendered and hopefully to report by May 2012.</p> <p>Work on case studies on how mitigation measures are implemented is underway (AC0227). It is not due to finish until March 2013, but some interim findings may be available in 2012</p>
<p>Feeding practices</p>	<p>Project AC0209 – on the capacity for ruminant nutrition regimes to reduce methane and nitrogen emissions - concluded in 2010: its overall conclusion was that we are largely limited by a number of constraints, such as lack of efficacy and long-term effects and benefits, high cost, practicality of getting additives into free-grazing animals, and undesirable effects on product quality (e.g. garlic taint).</p> <p>A current (ADAS) project - due to report in April 2012 - is reviewing UK and international research and literature on feed management which will result in new guidance material to be disseminated through the levy boards.</p> <p>The GRA Livestock Research Group has recently agreed the formation of a feed and nutrition net work, to which UK will be joint partners with Switzerland. This network will review international evidence on the role of feed and nutrition in controlling methane emissions and may examine feed additives.</p>
<p>NUE crops</p>	<p>Project AC0221 estimated the mitigation potential of both improved crop breeding and enhanced NUE with and without the aid of genetic modification.</p> <p>Project IF01110 is developing appropriate variety testing methodology for assessing the nitrogen requirements of new varieties in trials undertaken for national listing. This is due to conclude in March 2013.</p>
<p>Feed additives</p>	<p>Project AC0209 (mentioned above) looked at dietary</p>

and propionate precursors	additives. Given that the use of ionophores in beef and dairy cattle is currently illegal within the EU, research in this area is not considered a priority.
Soil drainage	Much if not all of the land that would benefit from drainage in the UK has already had under drainage installed. Previous work under ES0111 has mapped the location and types of drainage but age and quality of drainage installation is variable, as is the frequency and quality of maintenance. Benefits are considered to vary and there may be some trade off with biodiversity objectives. Work is being carried out to assess the status of drainage in UK agriculture and to understand where the use of land drains can enhance environment – WQ 0214
Nitrification inhibitors	Work underway (AC0213) to assess the extent to which this technology is likely to be effective in reducing emissions (+environmental impacts) in UK conditions. Due to report in 2014 Further complimentary work is ongoing in the platform project (AC0116) and the UK continues to engage internationally on development of the evidence base on improved nitrogen sources through the GRA and potentially the JPI.
Reduced tillage	At the time of the response to the CCC's 3rd annual report in 2010 it was felt that there was insufficient evidence to support this method and a concern that it might lead to increased nitrous oxide emissions. Defra are exploring the potential to undertake further research in this area in partnership with other funders.
Crop nutrient management	This is an area where Defra acknowledged that measures would be beneficial and potentially save costs. Updated Fertiliser Manual (RB209) encourages best practice supported by the Industry, CSF Tried & Tested activities. Project AC0111 is a large field scale project measuring air quality following fertiliser application to soil type representative of UK soils. Reporting Mar '13 but interim reports should be available. Link project LK0990 recently reported and considered the possibility of sensing grain N requirements for bread

	<p>making quality in the field through NIR sensing. The project delivered a mechanism to judge the cost effectiveness of late urea applications.</p> <p>MINNO, a link funded project is examining the potential to minimise the absolute emissions, and emissions intensity from a range of arable crops and products, including legumes. This work will feed into the GHG platform.</p> <p>Another link project (LK09134) is currently underway to consider effect on GHG emissions, nitrate pollution and productivity by fully automating N fertiliser management. Due to finish Sept '14.</p>
Improved breeding practices	<p>This is also an area where Defra acknowledged that measures would be beneficial and could potentially save costs. However, it was noted that breeding takes time and that care needs to be taken to guard against adversely affecting related sectors (i.e. beef and dairy).</p> <p>Some privately funded research on breeding improvement is currently being taken forward under the auspices of TSB.</p>

© Crown copyright 2012

You may re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit www.nationalarchives.gov.uk/doc/open-government-licence/ or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or e-mail: psi@nationalarchives.gsi.gov.uk

This document/publication is also available on our website at:

This document/publication is also available on our website at:

<http://www.defra.gov.uk/environment/climate/sectors/agriculture/>

Any enquiries regarding this document/publication should be sent to us at:

defra.helpline@defra.gsi.gov.uk