greenhouse gas action plan

Meeting the Challenge:

Agriculture Industry GHG Action Plan

Delivery of Phase I: 2010 - 2012

04 April 2011

This Action Plan has been developed by an Industry Delivery Partners group including:

ADAS, AEA, AHDB Agriculture & Horticulture Development Board, aic agricultural industries confederation, bpc british poultry council, CLA Country Land & Business Association RURAL ECONOMY IS OUR BUSINESS, FWAG Farming & Wildlife Advisory Group, LEAF Linking Environment and Farming, NFU, NIAB TAG, Organic Research Centre Elm Farm, Royal Agricultural Society of England

"We offer this Plan as a serious statement of intent and a commitment to reduce our industry's GHG emissions."

Agricultural Industry Greenhouse Gas Action Plan - Framework, February 2010

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Executive Summary

The agriculture sector is committed to playing its part in contributing to meeting the national target of an overall 80% reduction in greenhouse gas (GHG) emissions by 2050. In response to the last Government's Low Carbon Transition Plan, published in July 2009, this Greenhouse Gas Action Plan (GHGAP) has been progressively developed by an industry partnership to deliver an initial reduction of 3Mt CO_2e GHG emissions by 2020. Building upon an earlier Framework for Action published in February 2010, the first phase of this delivery plan sets out the process that will be implemented by a broad-based industry-led partnership, to encourage farmers and growers to take actions that will reduce their emissions over time.

There are significant challenges in implementing this plan, not least the technical complexities involved in reducing emissions that are an inevitable consequence of food production systems, and the fact that the agriculture sector is highly diverse in nature, served by many different organisations and networks. Nevertheless, this plan has identified a suite of priority actions that can be progressively implemented on-farm.

The initial focus of the delivery plan is to promote production efficiency, since this will both yield significant GHG savings and result in more robust farm businesses. The plan will also complement other environmental priorities, such as the protection of water resources, soils and biodiversity. It uses existing trusted delivery routes where possible, for example, recently published sector Roadmaps will be important vehicles for changing farm practices to improve production efficiency. This will minimise the potential proliferation of initiatives, simplify the task of delivery and minimise the duplication of effort across the partnership. Lastly, it sets out how the use of science and technical advice will be improved to influence and motivate behaviour change, and how the partnership will work with Government to develop a means of monitoring progress in the sector over time.

It is envisaged that this plan will be taken forward in three phases, using as far as possible existing initiatives and networks. Specific details are set out for how Phase 1 (2010 – 2012) will be put into practice. The plan will be reviewed and details for the implementation of Phase 2 (2012 – 2015) will be published in 2012. In Phase 1, particular emphasis will be given to establishing a foundation on which to consolidate further progress. More specifically, the feasibility of an Information Hub (iHub) and how it helps advisors deliver consistent messages will be explored, with a decision about piloting an iHub made in early 2011. A number of actions to establish a communications strategy are set out that will enable a prioritised approach to how messages are delivered, and to which farming sectors. This will enable finite resources to be used to make the biggest differences in awareness and uptake of on-farm actions.

Finally, a simple governance structure has been established that ensures a strategic approach to prioritised actions set out in this delivery plan, under the joint chairmanship of the officeholders of the CLA and NFU.

Introduction

1. Under the Climate Change Act 2008, the UK Government is legally required to achieve an overall 80% reduction in greenhouse gas (GHG) emissions from 1990 levels across the UK economy by 2050. The agriculture sector will need to play its part in contributing to meeting this target.

2. In response to the last Government's Low Carbon Transition Plan, published in July 2009, a Greenhouse Gas Action Plan (GHGAP) was developed by representatives of the agriculture industry as the principal mechanism for delivering their commitment to a reduction in annual emissions in England of 3 million tonnes CO_2-equivalent (Mt CO_2e) by the third carbon budget period (2018 – 2022)[1]. As an initial step, the industry partnership published a Framework for Action in February 2010. This described how the sector would aim to meet a 3Mt CO_2e reduction by increasing production efficiency and thereby reducing emissions per unit of output.

3. This delivery plan sets out the initial steps the partnership of English agriculture industry organisations will take to meet the 3Mt CO_2e reduction target. Whilst the key objective of the delivery plan is to achieve reductions in GHGs from the agriculture sector, the activities to encourage implementation of the necessary actions will also contribute to business efficiency and sector competitiveness, in particular:

a) Providing farm businesses with the tools and knowledge to improve the efficiency of resource and energy use and hence competitiveness; and
b) Helping farmers meet production and multiple environmental goals through the implementation of the same actions.

4. This delivery plan sets out an ambitious long-term programme of work by a partnership of organisations that are already working to encourage adoption of farm practices that help the farming sector become more competitive, whilst enhancing landscape and biodiversity. Significant progress has already been achieved in recent years. But this delivery plan is anything but "business as usual". It is about taking a strategic approach and enhancing the way that important messages, technical advice and information are delivered to farmers and growers. It is about being able to benchmark our performance and build on it. In short, it is about professionalism.

Objectives

5. To achieve the 3Mt CO_2e reduction this delivery plan will:

a) Establish a robust partnership that will stimulate and deliver the voluntary approach to achieve a range of beneficial changes throughout the agriculture sector by specifying and adopting practices that improve production efficiency and thereby reduce the need for regulation.

[1] Whilst the 3Mt CO_2e reduction target is not a statutory commitment under the Climate Change Act, it was the last Government's estimate of what was considered to be realistically achievable by 2020. In its response to the 2nd Annual Report of the Committee on Climate Change, the Coalition Government stated that, until better evidence is available, it will continue to use 3Mt as an indicative figure.

b) Improve awareness amongst farmers and growers of GHG emissions and of the particular farm practices that will improve efficiency and business performance, whilst simultaneously reducing emissions.

c) Drive the implementation of on-farm practices that reduce GHG emissions per unit of production in a manner that promotes animal health and welfare and environmental protection by:
   i. Improving the use of science to continuously update technical advice and decision making tools;
   ii. Developing innovative, effective means of delivering business and technical advice to farmers and growers that motivates and enables them to adopt improved practices;
   iii. Enhancing partnerships and networks to improve penetration of awareness in each sector and stimulate uptake and adoption of innovative and beneficial practices.

d) To work effectively with the GHG Data Management and Modelling Project funded by Government (GHG AC0114) to share fit-for-purpose information and data that will enable progress in reducing GHG emissions in the agriculture sector to be measured over time.

Greenhouse Gas Emissions from Agriculture: Current Estimates

1. Although the current GHG inventory is incomplete and subject to uncertainty, current estimates suggest that agriculture is responsible for about 8% of UK GHG emissions, over 90% of which are from non- CO_2 gases (nitrous oxide and methane) emitted from inorganic and organic sources of chemically reactive nitrogen containing compounds in soil, ruminant livestock and manure.

Nitrous Oxide (N_2O)

2. Nitrous Oxide is 298 times more powerful as a greenhouse gas than CO_2.
   a. Agriculture is the single largest emitter of this gas: 25.9 Mt CO_2e in 2008, accounting for 75% of total UK N_2O emissions;
   b. Main sources of N_2O are inorganic and organic nitrogen-containing compounds in soil used to fertilize crops (including pasture) and manure from livestock (including manure heaps, and slurry and manure applied to pasture) – 34% is directly associated with livestock;
   c. Emissions of N_2O from agriculture have declined by 24% since 1990, through a combination of improved best practice in crop nutrient application and a reduction in ruminant livestock numbers following CAP reform.

Methane (CH_4)

3. Methane is 25 times more powerful as a greenhouse gas than CO_2
   a. Agriculture responsible for 38% of total UK CH_4 emissions;
   b. Main sources of methane are from digestive fermentation in ruminants, and manure from livestock.
   c. Since 1990, methane emissions have declined by 18% due to a reduction in ruminant livestock numbers following CAP reform.

Carbon Sequestration

4. Agriculture and other land management practices have a positive role to play in climate change mitigation because there is significant potential to remove CO_2 from the atmosphere by the process of photosynthesis and storage as living biomass (vegetation) or as soil organic matter (carbon sequestration).

Overall Approach

6. A focused step by step approach to implementation has been agreed with delivery partners:

- **Phase 1: (2010 – 2012):**

  This phase will focus on the establishment and consolidation of the key activities to underpin future implementation, including: a communications strategy; a feasibility study for an Information Hub (iHub); identification of key actors able to influence and deliver GHGAP activities; implementation of sector roadmaps and working with Defra to develop a fit-for purpose approach to monitoring GHG emissions reductions with time. Actions and milestones are set out in more detail in this plan.

- **Phase 2: (2012 – 2015):**

  This phase will be defined in further detail in an updated delivery plan to be submitted in **April 2012**. By this time, the partnership will have established key messages and supporting evidence, and will be actively promoting improvements in farming practices in target sectors. Lessons learned from this initial activity and new technical knowledge will be applied to enhance the approach for the next target sectors. With this experience and momentum, the level of ambition in terms of sector penetration will be stepped up. The Steering Group will also be working actively with the GHG Data Management and Modelling Project to ensure that the industry information and data sources are being used effectively so that the UK is able to estimate progress in GHG emissions reductions with time. By 2015 the partnership will have achieved a high level of awareness in all farming and growing sectors, with evidence of a clear trend towards increased uptake of the priority actions.

- **Phase 3: (2015 – 2020):**

  By 2015, the GHG Inventory research programme will be able to report its outcomes. This will enable the GHGAP activities to be targeted on the basis of an improved evidence base. By 2018, the majority of farmers, growers and advisors need to be actively implementing priority on-farm actions relevant to their farm type. By this time, additional evidence will have been gathered with which to persuade farmers of the economic benefits of adopting such actions. Other supply chain initiatives and assurance schemes may be offering positive levers for change. Monitoring methodologies will be more clearly defined as a legacy of the Government-funded GHG Inventory research. These should enable more accurate assessment of progress, which will allow the Steering Group to focus activity where it can make the most significant difference. Ongoing monitoring and analysis of the evidence base will be required from 2015 onwards.

Challenges

7. Achieving the 80% reduction in GHG emissions will present all sectors of the UK with a significant challenge, but those faced by the agriculture sector are unique. Food production involves natural biological processes that inevitably release GHG's. Crops require nitrogen for growth and to produce economic yields. Livestock release methane as a result of enteric fermentation and manure is an unavoidable by-product. Variability in environmental conditions, such as temperature and rainfall is uncontrollable, and will influence food production and associated emissions. To deliver a 3Mt CO_2e reduction the following challenges will need to be addressed:

a) Technical difficulty in reducing emissions in biological systems and limited availability of new technologies that might help deliver GHG emissions reductions;
b) Uncertainty about sources of emissions from different compartments of food production systems, and how they are influenced by external conditions such as temperature and rainfall;
c) Wide diversity of farm types and production systems in England, operating in a wide range of physical environments, e.g. soil types. There is no "one size fits all" solution;
d) Motivating farmers in such a complex sector; there are a range of motivations for farming – not always profit driven – and ever increasing pressures. Many traditional farming businesses are reluctant to change established practices and adoption of new approaches can be slow;
e) Actions to increase production efficiency and reduce emissions may not be compatible with animal health and welfare or with achieving environmental benefits such as wildlife and landscape conservation. The environmental challenge is multi-faceted. It is not easy to identify the "best fit" for an individual farm business, because difficult "trade-offs" need to be addressed;
f) Since the privatisation of the state advisory system the network of private extension and advisory agencies has become diverse and complex. Different organisations pursue different business strategies in different regions and sectors of the industry. Expertise and resources are sometimes limited.
g) External weather-related factors and the unpredictability of pest and disease occurrence can impact on production efficiency and associated emissions reductions. These are often beyond the control of farmers and growers.

8. The complexities and challenges should not delay progress in taking steps to increase the implementation of on-farm actions to reduce GHG emissions. It is acknowledged that there is uncertainty about GHG emissions, and that technical solutions to their reduction in food production systems will take time and investment to deliver in the longer term. Nevertheless, there are a suite of actions that can be implemented on-farm to deliver improved efficiency of production and a reduction of emissions per unit production. This delivery plan will focus on encouraging the implementation of these actions. It is considered important to lay these foundations so the industry is better equipped to meet the more ambitious challenges posed by climate change in the future, and in doing so complement actions to improve the sector's competitiveness and resilience.

Key Principles

9. Recognising current fiscal pressures in government and industry organisations, this delivery plan will interact with, as far as possible, existing industry and Government initiatives and trusted networks that supply advice and information to help farmers and growers improve efficiency across various sectors. It will provide a strategic oversight of sector and government activity and so ensure more effective delivery without duplication. For example, sector Roadmaps, the Tried & Tested nutrient management programme, and professionally qualified farm advisers, among others, will be used to deliver behaviour change across the industry. This will require the building of a close working partnership between the delivery bodies associated with the GHGAP.

10. This approach will:

a) Avoid duplication of effort and wasted resources, only developing new initiatives where they address a clearly identified gap, including how data are gathered to monitor progress;
b) Ensure that agreed "industry standard" technical messages are developed and promoted to farmers, to provide clear understanding and confidence to implement;
c) Avoid confusion and "initiative and information overload" amongst farmers and other primary audiences;
d) Help achieve milestones early if initiatives are already making progress in delivering advice;
e) Enhance existing mechanisms and provide an additional stimulus for achieving further efficiencies;
f) Provide a platform from which to develop additional initiatives, if required to fill gaps that cannot be addressed through existing networks.

11. The development of advice and messages will be implemented according to the following principles:

a) The focus will be to encourage actions that achieve emissions reductions through increasing the production efficiency of each farming system, so decreasing emissions per unit of production. This will seek to deliver win-win solutions where greater efficiency optimises production and improves economic performance, achieving emissions reductions as a result.

b) Actions that are considered cost neutral or cost-negative will be encouraged at this initial stage. In taking a voluntary approach to GHG emissions reductions, it is only realistically possible to start the process of engagement with sceptical audiences by encouraging uptake of actions that do not entail significant investment by farmers. However, further efficiencies may only be possible by investment in infrastructure, for example building or equipment maintenance. It will be important to demonstrate the economic case for such investment in subsequent stages. Thus, most of the actions identified offer the potential of improved returns for farmers and growers.

c) Opportunities will be sought to improve and integrate advice to farmers where implementation of certain actions can help meet more than one objective. For example some measures to control nitrous oxide emissions, e.g. slurry and manure storage systems, will also help control ammonia

emissions, making an important contribution to statutory air quality targets, as well as potentially providing a renewable energy source. Any conflicts and contradictions in existing advice will also be identified and addressed to help improve consistency of messages.

d) Gaps in available advice, evidence and delivery will be identified. Delivery of the GHGAP will require the active involvement of Defra to:
   i. Enhance the evidence base through its research programme (and co-ordinating research priorities with Research Councils (e.g. BBSRC and NERC);
   ii. Provide supportive communications, evidence and to address inconsistencies in policies or advice;
   iii. Develop and support methodologies to monitor uptake of actions and progress indicators;
   iv. Make use of opportunities to secure incentives to help farmers implement GHG mitigation actions, for example through CAP reform and environmental markets.

Priority On-Farm Actions

12. The Government has announced its intention to review progress with the GHGAP in 2012. This Delivery Plan focuses mainly on the actions to be taken up to this milestone, but it also sets out a proposed direction of travel for the longer-term. The approach taken to developing the GHGAP has been to identify and prioritise:

a) key actions that will improve production efficiency and GHG emissions reductions;
b) activities that encourage the uptake of the relevant practices in each farming sector;
c) gaps and opportunities that can be addressed through the plan;
d) actions to be taken forward in the short term, and in subsequent phases of the GHGAP.

13. Annex A sets out in detail the priority actions to be implemented at farm level in order to achieve production efficiencies and thereby reduce emissions per unit of production. Whilst there is some uncertainty about the emissions abatement potential of each action, the evidence suggests that each can improve the competitiveness of farming businesses by achieving efficiencies in production and reducing losses.

Summary of on-farm actions to be encouraged by the GHGAP:

a) **Adopting best practice in soil and land management**

b) **more efficient crop and grassland production**:
- Using crop, soil and manure assessments, nutrient plans, industry standard recommendations, decision support tools (e.g. Defra Fertiliser Manual - (RB209) and, if needed, professional advice to achieve balanced fertilisation and nitrogen use efficiency for each crop;
- Calibrating fertiliser and manure application equipment;
- Monitoring crop development closely to optimise the timing and frequency of fertiliser and crop protection product applications according to the crop requirements, emerging pest or disease threats and weather conditions.

c) **more efficient management systems for livestock**:
- Considering the benefit of using professional nutritional advice to plan feeding regimes;
- Monitoring growth and performance of livestock closely to allow early interventions where necessary;
- Implementing health plans with veterinary advice to control disease;
- Using animals with high Profitable Lifetime Index (PLI) or high Estimated Breeding Value (EBV) when breeding;
- Plant grazing land with a clover mix / higher sugar grasses, where appropriate and this does not affect environmental land management agreements or obligations;
- Appropriate slurry and manure management.

d) **more efficient use of on-farm energy and fuel**:
- Installation of equipment that uses or generates energy with lower carbon emissions, including the use of renewable electricity, heat and fuels;
- Improving the production, storage and use of heat on farm;
- Matching farm equipment specifications with on-farm needs e.g. optimising power output with fuel efficiency;
- Maintenance, repair and management of buildings (including optimizing insulation and ventilation), vehicles and equipment, for example calibration of equipment, tyre pressures, etc.

Activities Encouraging On-Farm Action

14. There is already a diverse range of initiatives and advisory networks that aim to deliver improved efficiencies in food production, and with it, greater competitiveness of the farming sector. This delivery plan will seek to engage with these trusted and established delivery routes to promote the priority on-farm actions listed above.

Examples of existing industry activities

Initiative	Areas of activity and delivery	Lead organisation(s)
Training farm advisers		
FACTS and BASIS	CPD programmes in crop nutrition and crop protection respectively	AIC and BASIS
Institute of Organic Training and Advice	Training and accreditation of organic farming advisors, including climate change mitigation.	IOTA / ORC and partner organisations
Training, promotion, information and advice to farm		
Catchment Sensitive Farming (CSF)	Reducing diffuse pollution in priority catchments, promoting best practice on soil and nutrient management	CSF Officers (NE/EA)
Tried & Tested	'One-stop shop' for information and support on nutrient management	Professional Nutrient Management Group
Precision Farming	Advice, information, events for the arable sector	HGCA
Voluntary Initiative on Pesticides	Promoting best practice in pesticide use (also supporting crop health aspects of GHGAP)	VI Steering Group
Milk Roadmap	Improvement in resource use efficiency	DairyCo and NFU on the Milk Roadmap
English Beef & Sheep Production Roadmap "Change in the air" –	Mitigating the effects of climate change by reducing GHG emissions and energy use.	EBLEX, in partnership with other Organisations
Integrated farm management	Advice on soil management, nutrient management, energy efficiency, crop health, water management, animal husbandry, landscape and nature conservation – "Whole Farm Approach" can be applied to any site	LEAF Demonstration Farm Network, FWAG, TAG etc
Organic farm management	Advice and specific advisory tools on organic soil, crop and livestock management, energy and other resources use.	ORC, Soil Association and partner organisations
Farming Futures	Awareness raising and advice on climate change, including adaptation and mitigation	Forum for the Future, CLA, NFU etc
CALM Calculator	Awareness raising and enabling land managers to assess emissions and sequestration potential of their businesses	CLA
Campaign for the Farmed Environment (CFE)	A voluntary approach to achieving the environmental benefits from non-productive land to benefit resource protection and biodiversity.	NFU, CLA in partnership with other organisations
Defra Fertiliser Manual RB209	Revised technical guidance and decision support tool for the optimisation of crop nutrient inputs	Defra, FACTS, AIC, ADAS etc
Supply chain		
Farm Assurance	Range of schemes supporting production efficiency, soil management *etc*	AFS (Assured Food Standards)
Dedicated supply chain initiatives	Each supply chain is unique but include resource use efficiency and carbon footprinting	Individual supply chains
National labelling schemes	e.*g.* LEAF Marque, Organic, etc	LEAF (lead organisation), and other Individual schemes

15. Annex B sets out in more detail the current and new activities underway that will be the key delivery channels for each priority on-farm action.

Opportunities

16. A recent analysis drawing on the key findings from four recent Defra funded studies[2] into abatement potential in the agriculture sector, and a joint industry-CSF report on nutrient management provide a guide to where action to reduce greenhouse gas emissions from the agriculture sector could be focused. The key points are:

a) Large dairy, cereal and mixed farms seem to have greatest abatement potential (an estimated 37% of total available potential) (AC0222).

b) Farmers would be most receptive to information and advice about GHGs if the actions to mitigate emissions are presented in terms of the benefits *i.e.* savings and incentives, and how such actions meet other environmental outcomes.

c) The main drivers for uptake of mitigation actions are ensuring best management practice and economics. Financial drivers may be direct e.g. savings on inputs from correct planning and accurate application; or indirect e.g. complying with market / buyer requirements.

Scope for progress

17. Given the significant diversity of farm types, it is difficult to establish an accurate baseline of current farm activity and collate progress and uptake of additional on-farm actions across the full spectrum. But studies suggest that:

a) Advice on crop nutrient management and some aspects of soil protection is widely available and used by growers. A wide range of nutrient management planning tools are already is available, including advisory documents and software, advisers and paper or computer-based plans. However, many of these tools are complex and depend on technical skills and knowledge with access to and familiarity with, computers and the internet.

b) Uptake of planning tools is generally is good among arable farms and larger farms. In particular, these farms should have little difficulty implementing the new Fertiliser Manual or NVZ Guidance. Both PLANET and Tried & Tested are suitable for nutrient management plans.

c) Nutrient management practices are most advanced on arable farms but there appears to be scope for further improving the use of nutrients in organic manures. A new stand-alone version of MANNER-NPK would be helpful in

[2] "SAC MACC 2" – Review and Update of UK Marginal Abatement Cost Curves for Agriculture
"AC0222" – Agricultural Greenhouse Gas Mitigation Feasibility Study
"Market segmentation" – Market Segmentation in the Agriculture Sector: Climate Change (FFG0918)
"Advisory Service Analysis" – Agricultural Advisory Services analysis (FFG0912)

supporting progress in this area, if resource can be secured. The current version is only available embedded in PLANET (which is not popular with livestock farmers who prefer MANNER software).

d) Nutrient management planning on dairy farms seems to be rather less common than it is on arable farms but most farms have a nitrogen management plan if they are in an NVZ.

e) Uptake of nutrient management planning is relatively low among grazing livestock (beef and sheep) farms. These may be generally low input users, with therefore a lower economic driver for change. But the scope for improving nutrient management planning and soil management practices appears to be greatest in this particular sector. The range of available planning tools has been less suitable for these farms due to their type, complexity and requirement for computer use. The Tried & Tested campaign may fill this gap, as it is paper-based. A training version of the Fertiliser Manual grassland recommendations and a simple guide to organic manure management would be helpful.

f) There is comparatively less penetration of advice on animal health and nutrition in the livestock sector. Anecdotal evidence suggests that dairy enterprises receive regular veterinary visits, but the beef and sheep sectors appear to use comparatively less veterinary advice.

Understanding current awareness about GHG emissions

18. The GHGAP aims to increase awareness of GHG emissions. The Agricultural Greenhouse Gas Mitigation Feasibility Study (AC0222) conducted by ADAS[3] reveals that:

a) There is generally low awareness of GHG emissions across the farming sector, with 51% farmers placing little or no importance on this when making decisions on the management of their farms. There was low awareness of Government aims for reducing emissions from the agriculture sector.

b) The greatest awareness of GHGs was in cereal and general cropping sectors where growers were more likely to believe it was important to consider GHGs in decisions (18% arable and 17% of small farms found it very important).

c) 39% of the sample was aware of the GHG Action Plan.

[3] Involved a sample of 751 farmers

Summary: Awareness about GHGs in different farm types (Defra research contract AC0222 – undertaken by ADAS):

	Total	Cereals	General Cropping	Dairy	Cattle & Sheep Upland	Cattle & Sheep Lowland	Small	Medium	Large
Total	***751***	***150***	***150***	***150***	***150***	***151***	***251***	***250***	***250***
Methane	42%	32%	31%	57%	44%	47%	45%	37%	44%
Carbon dioxide	28%	43%	52%	13%	21%	15%	29%	24%	32%
Nitrous oxide	11%	20%	29%	1%	5%	1%	12%	8%	14%
None of the above	42%	38%	31%	41%	51%	49%	39%	48%	39%

19. Whilst highlighting the degree of challenge in implementing the GHGAP, this study does reveal that certain groups of farmers have a good awareness about GHGs and are taking action and planning their on-farm actions accordingly. There is a common perception (mainly in the beef and sheep sector[4]) that GHG mitigation only involves new burdens and costs. Experience within the partner organisations suggests that many farmers simply need to become aware of the linkage between good husbandry, production efficiencies and GHG mitigation to accept the reasoning.

[4] ADAS, 2010

Key GHGAP Activities

20. The GHGAP will use the detailed outputs from the research described to shape how it will enhance awareness raising and co-ordinate the provision of expert advice. The key activities to be taken forward will be:

a. Use opportunities under existing work programmes in each partner organisation **to improve co-ordination of advice and information** so that advisory networks serving different farming sectors deliver consistent and up to date messages. This will include **continued and enhanced training and professional development of advisors** (e.g. FACTS and BASIS) and provision of information to animal health and feed professionals, e.g. veterinarians, animal feed nutritionists and advisors. It will also use other routes of influence e.g. feed compounders and agricultural merchants who have more contact and influence with those parts of the farming sector that are less engaged with professional advisors and vets.

b. **Consider developing an Information Hub (iHub)**, which will allow all partner organisations and their advisory networks to source common messages and materials, thereby ensuring delivery of consistent messaging to their sectors. An iHub could make it possible for any single adviser, consultant or sales representative to provide contacts and signposts to other relevant information, thus maximizing the value of each farm visit and increasing the likelihood of a positive shift in implementing beneficial actions. The concept and proposed action for the "iHub" is covered in more detail in the next section.

c. **Develop a communications strategy** that harnesses the developing experience and expertise of the partner organisations to improve targeting and impact of messages and advice. The strategy will focus on where the biggest gains in progress can be made in the farming sector for a given level of effort. Most grazing livestock farms are small, and are also, historically, the hardest to reach in terms of awareness raising and technical advice. In total, they account for around half the agricultural area of the UK, so collectively they make an important collective contribution to overall emissions and potential abatement. The communications strategy will seek to use existing agriculture segmentation work to further develop priorities for targeting messages. It will also be important to be clear about what farmers are being asked to do, developing messages that resonate with different audiences and farm types, as well as to monitor their impact. The communications strategy is covered in more detail later in this Plan.

d. Continue to **develop and promote farm audit approaches, including the CLA Carbon Accounting for Land Managers (CALM) calculator** – a free online resource that help land managers work out the balance of greenhouse gases emitted by farming businesses, set against the carbon stored in their trees and soil. This will help raise awareness and inform the decision making of farming businesses about adopting or enhancing on-farm actions, in an integrated way that can help reduce actual emissions at source.

e. Continue to **enhance the supporting evidence base, through working closely with Defra and research organisations to identify da**ta sources and evidence gaps, agree on key messages where there is uncertainty and

conflicting research outputs, and prioritise the science and knowledge exchange investment needs for the sector.

f. **Development of case studies** and economics evidence to support messages to promote adoption of on-farm actions and to explain how other environmental outcomes can be achieved through a single activity.

g. Active **participation in Defra's advisory "pilot" project** to further develop how integrated advice and messages can be delivered effectively, and continue to work with Defra to improve training and skills strategies.

Consideration of an Information Hub (iHub)

21. Significant thought and consideration has been given to whether an iHub needs to be developed to act as a repository of information to assist advisors, farmers and other interested parties to access consistent and reliable advice on production efficiencies and GHG mitigation. Farmers and their advisors are currently faced with a daunting amount of information from many different sources, and there are circumstances when advice focused on one outcome can conflict with advice focussed on another.

22. The iHub could fulfil the following potential objectives:

a) Act as a focal point to direct advisors to information, such as tools, resources, statistics or scientific papers, whatever their speciality;
b) Provide a synthesis of recent research so that advice can be regularly updated;
c) Highlight possible contradictions and inconsistencies in advice enabling advisors to understand where potential tensions exist and so to adjust advice depending on their client needs and type of business;
d) Assess the usefulness of research outputs and advice and provide feedback to research providers and funders on additional evidence needs.

23. In order to progress this concept, the following actions are proposed:

Action 1:

a) With input from the GHGAP Steering Group, AHDB will undertake a feasibility study, that will include:
  i. An assessment of the need for an iHub;
  ii. Proposals for how an iHub can provide optimum value to advisors;
  iii. Options for how development of an iHub can be taken forward, including host organisations, recognising existing initiatives and websites;
  iv. A breakdown of required resources including input from partner organisations.
b) The Steering Group will consider this study and decide whether to implement a pilot iHub by end-April 2011.

Action 2: If it is agreed to test the iHub concept, and provided resources can be secured, a pilot iHub will be built and ready to test by advisors by end-April 2012.

Communications

24. Communications is vital to the GHGAP achieving its objectives, particularly raising awareness of GHG emissions and in delivering advice and technical support that enables the implementation of the priority on-farm actions. As already highlighted, the degree of challenge is significant because of the complexity of the issues, the diversity of the agricultural sector and also the need to develop consistent messages for use in many delivery networks. A number of actions have been identified to address this challenge.

Ensuring clear operational communications with partner organisations

25. There are a large number of organisations and networks that can play an important role in contributing to a 3Mt CO_2e reduction. For example, retailer organisations fund their own knowledge transfer programmes. It is not possible, nor is it appropriate for the GHGAP to seek to assume oversight or influence over the initiatives and activities already in place. It is important that organisations continue to have ownership of their own initiatives, which are tailored to the specific needs of their sectors. But it is vital that there is a common strategic understanding of how initiatives fit with and contribute to achieving the objectives of the GHGAP. Sharing experience and ideas between initiatives through a process of ongoing dialogue will also contribute to a successful outcome.

Action 3: GHGAP Steering Group members to continue liaison with other farming organisations, service providers and their networks. Establish links with the trade press to help early promulgation of key messages.

Action 4: GHGAP Steering Group to establish dialogue with retailer organisations and other key players in the food supply chain about the role they play in providing advice and incentives. It is proposed that given the potential complexity of these discussions, and the need to ensure they fit within a wider policy framework of food security, that they are facilitated by Defra within the existing Supply Chain Network.

Awareness about GHG Mitigation

26. The GHGAP's success will depend on developing messages that increase awareness about how improving the efficiency of resource use, be it nutrients, livestock, energy etc - regardless of the farming system - makes good business sense. Partner organisations are already promulgating messages, encouraging best practice and providing technical advice. The GHGAP partnership offers an opportunity to use the expertise in the participating organisations to provide a strategic overview and map out the current reach of existing networks and develop solutions to using them more effectively to improve the overall level of awareness.

27. Ideas about sector segmentation bespoke messaging and engagement methods will be shared by the GHG Steering Group in order to agree priorities for awareness raising activities. Where appropriate, the Defra communications team and social scientists will be invited to help consolidate understanding about

engagement methods and success stories. Farming Futures has acquired considerable expertise and experience in this area, and has built a good reputation in parts of the agriculture sector, and useful lessons from this initiative can be usefully applied in helping the GHGAP Steering Group develop and enhance the partnership's ability to raise awareness. It will be important to prioritise activity on the basis of where the greatest progress in GHG emissions reductions can be achieved in given sectors, thus enabling effective targeting of existing resources.

Action 5: The GHGAP Steering Group will identify sectors where the biggest gains in production efficiency can be achieved. The Steering Group will map out the current reach of existing networks and develop solutions to using them more effectively to improve the level of awareness in the priority areas.

Action 6: GHGAP Steering Group will commission the development of common key messages and updates (e.g. common PowerPoint presentations) that can be deployed at meetings, conferences and other forums.

Provision of convincing evidence and technical advice

28. The success of the messages will be reliant on reliable data on the costs and benefits associated with any particular practical mitigation actions. In order to encourage changes in farming practice, simple messages need to be supported by case histories that are relevant to the target audience. Often, messages can be better delivered by farmers sharing experience in small groups. Many partner organisations already facilitate such groups. The role of the farming press in promoting best practice and case histories is important, and it is important that relationships between partner organisations and key publications are maintained.

Action 7: Relevant information and case histories will be identified and consolidated with co-operation of Defra scientists and economists and with time, a wider network of research networks. All Steering Group organisations will adapt workshops to use this information, and consider how farmer "champions" and the farming press can play a role in communicating benefits.

29. Up to date technical information and advice is already continually developed and promulgated by the partner organisations. In the next few years, there will be increasing output from research, for example the Government-funded GHG research platform, and it will be important to ensure that a significant amount of new information will be effectively and accurately used by knowledge transfer networks. The GHGAP Steering Group has discussed the possibility of a GHGAP brand *i.e.* GHGAP-approved information bearing the joint technical branding of the GHGAP and the delivery body/bodies. With time, this will help reinforce messages, and become a recognised brand of reliable materials to aid the provision of co-ordinated advice.

Action 8: GHGAP Steering Group will develop the concept of branding advice.

Monitoring Progress to 2012

30. Progress in implementing the GHGAP to 2020 will be measured in three ways:

a) Monitoring progress in implementing the processes and actions for Phase 1;
b) Monitoring and assessing level of active uptake of actions by farm businesses;
c) Estimating emissions reductions with time.

Progress in implementation of Phase 1: 2010 - 2012

31. Defra proposes to carry out a review of progress of the GHGAP in 2012. Irrespective of Defra's review, it will be important for the GHGAP Steering Group to monitor progress in delivering its intended operational activities. It needs to be recognised that there is always a lag-time between implementing actions to encourage changes in practice, and detecting a measurable change. It will not be possible in 2012 to claim that positive shifts in uptake of the priority on-farm actions are as a result of the GHGAP, firstly because the baseline is not well established, and also because a number of initiatives such as the sector Roadmaps and other industry initiatives are already driving change in the right direction. Therefore, the milestones and targets for the first phase of the GHGAP, which includes the actions set out in this delivery plan, are focussed on the establishment and consolidation of processes that will provide the delivery foundations for changes in farming practice. These actions are summarised on Page 20.

Action 9: The Steering Group will monitor progress against these milestones and will provide annual reports to the Secretary of State in spring of each year, with one interim report in summer 2011 to capture early progress in the run up to the 2012 review.

32. This phase of GHGAP delivery focuses on process and activity to the progress review in 2012 because the Steering Group is aware of the need to lay a solid foundation to meet its future ambition. The delivery partners have agreed milestones for each action that will be used by the Steering Group to monitor progress and prioritise activities.

By spring 2012, we aim to have achieved the following:

Action	Target Date
iHub:	
Action 1: AHDB to undertake feasibility study to assess need for I-Hub and possible options, to inform a GHGAP Steering Group decision on implementing a pilot.	by **end-April 2011**
Action 2: Subject to Steering Group agreement on the need for an iHub, a pilot will be ready for testing by selected advisors.	by **end-April 2012**
Communications Strategy:	
Action 3: GHGAP Steering Group members to continue liaison with other farming organisations, service providers and their networks. Establish links with trade press.	**Ongoing**
Action 4: GHGAP Steering Group to establish dialogue with retailer and other key organisations in the supply chain about advice and incentives.	by end **February 2011 – then ongoing**
Action 5: GHGAP Steering Group to identify sectors where biggest efficiency gains can be gained and map out current reach of existing networks.	by **end April 2011**
Action 6: GHGAP Steering Group members to commission development of key messages and updates that can be deployed at meetings, conferences and other forums.	by **end April 2011**
Action 7: Information and case histories identified and consolidated with co-operation with Defra, a wider network of research networks. Farmer "champions" identified to communicate benefits.	by **end October 2011**
Action 8: GHGAP Steering Group to develop concept of branding of advice.	by **end October 2011**
Industry Sector Training Initiatives • Training for advisors delivering climate change related advice and messages will be integrated into new FACTS courses; • GHG advice, messages and information made available to vets (via BVA, BCVA BSVA, RUMA etc), animal nutrition advisors and feed representatives; • Demonstration Farms actively promoting the key on-farm actions set out in this Delivery Plan; • Identify standards in assurance schemes that will benefit GHG mitigation and develop options for how these can be enhanced to support GHGAP delivery.	by **end March 2012**
Governance and Monitoring Progress:	
Action 9: Reporting progress: • Interim progress report to Secretary of State	by **end-July 2011**
• Annual GHGAP progress report to Secretary of State	by **end- April 2012**
Action 10: Work closely with GHG Inventory Data – Mining Team to ensure industry information sources are used as effectively as possible to help monitor progress in emissions reductions	Ongoing – timetable set by research consortium
Action 11: Establishment of fully representative Steering Group.	by **end-January 2011**

Monitoring uptake of on-farm actions and associated emissions reductions.

33. Both Government and the GHGAP partnership organisations need measurable, reportable and verifiable indicators of emissions in order to track progress in emissions reductions with time. However, the GHG inventory for agriculture and land use is currently not well developed. There is significant lack of confidence about the emissions currently attributed to different components of land and farming practices, because there is significant variability in between soil types, weather conditions and land management practices. Therefore, the GHG emissions abatement potential of the sector is also very uncertain. Defra is investing in a significant research programme to enhance the GHG inventory for agriculture.

34. This research will develop a more detailed methodology in which specific emission factors are integrated with detailed agricultural data that map differences in farm practices that affect emissions, and which can track the adoption of mitigation methods by the industry. Defra project AC0114 (part of the GHG Platform) is tasked with developing a revised inventory methodology that better represents the structure of the industry. An initial workshop held in December indicates that this project has the potential to meet some of the needs of the GHGAP in terms of measuring its longer-term contribution to GHG emissions reductions. A further workshop in early March will consider end-user requirements in further detail.

Action 10: Key members of the GHGAP will continue working closely with the data-mining team to ensure that existing sources of information are used as effectively as possible and that the emerging methodology and statistical analysis provides an effective means of measuring progress in GHG emissions reductions in the agriculture sector.

Governance

35. The development of the GHGAP has involved a significant number of partner organisations. Delivery of the GHGAP will continue to be dependent on effective co-ordination between the organisations closely involved in the partnership, and a gradually increasing wider network of delivery partners and interested parties. Given the diversity of the farming sector, it is necessary to involve a wide range of expertise, and this increases the challenges in ensuring action is co-ordinated and key milestones are met. A governance structure has been established that will drive and monitor progress, motivates partners and reports to Government and others on performance.

GHGAP Steering Group

36. Implementation of the GHGAP objectives will require clear leadership and an effective mechanism for co-ordination, prioritisation and monitoring progress with actions. A Steering Group will be established with a membership that reflects the breadth of GHGAP activities with the following Terms of Reference:

a) Initiate, co-ordinate and oversee the GHGAP's work streams to deliver to the milestones set out in this delivery plan;

b) Evaluate the effectiveness of the delivery plan in enhancing mechanisms of delivery of advice and messages;

c) Identify gaps in advice and information provision, and other blockages to progress and agree steps to address these to facilitate progress;

d) Report regularly to Ministers on the progress against agreed targets and milestones.

e) Monitor progress in working with the GHG Data Management and Modelling Project funded by Government (GHG AC0114) to deliver a solution to monitoring future progress in GHG emissions reductions in the agriculture sector.

Ways of Working

37. The GHGAP Steering Group will:

a) Meet formally with a CLA or NFU officeholder chair at quarterly intervals to review progress;
b) Decide on a case by case basis the need for initiating sub-groups to undertake specific areas of work or lead particular activities. Experts or organisations with particular expertise (e.g. veterinary, communications) may be co-opted on to such sub-groups.
c) Meet in a "technical mode" with an agreed chair to address technical or communication issues in more detail (in practice these may take place on the same day as a formal meeting).

Membership

38. The membership of the GHGAP Steering Group needs to strike a balance between involving the partner organisations in the overall governance process, whilst ensuring that the entity remains manageable, flexible to respond to new circumstances and opportunities and is capable of operating effectively and efficiently:

a) As of November 2010, the membership comprises: ADAS, AEA (Agricultural Engineering Association), AHDB (Agriculture and Horticulture Development Board), AIC (Agriculture Industries Confederation), CLA (Country Land and Business Association), Farming Futures, FWAG (Farm Wildlife Advisory Group), LEAF (Linking Environment And Farming), NFU (National Farmers Union), NIAB/TAG (National Institute of Agricultural Botany/The Arable Group), ORC (Elm Farm Organic Research Centre), RASE (Royal Agricultural Society of England).

b) A senior member of the DEFRA climate change mitigation team will be invited to sit on the Steering Group to reflect the Government position, observe progress and link actions determined by the Steering Group to activity within Defra and across Government, as well as help identify opportunities where Government interventions can help the GHGAP deliver its milestones;

c) The GHGAP is a developing entity, and the overall approach will be responsive to changes in policy, scientific developments, and farming circumstances. The detailed approach may need to be refined to keep pace with such changes. The membership will need to be flexible and new members may be invited to join to the Steering Group for limited or extended periods of time in order to assist with the response to new developments and to seize new opportunities to deliver the overall objective of the GHGAP.

Chairmanship

39. The GHGAP Steering Group will be jointly chaired by industry-based officeholders from NFU and CLA. The role of Steering Group's Chairs will be to:

a) Ensure that organisations participating in the GHGAP partnership deliver their agreed actions, and that solutions to barriers to progress are identified and progressed;

b) Act as joint "ambassadors" for the GHGAP partnership in meetings with the Government, at conferences and with farming press;

c) The Chair will report on behalf of the Steering Group to DEFRA ministers and other interested organisations (for example, Committee on Climate Change) on the GHGAP's progress, and where necessary, present a case for how Government or other assistance can help progress.

Funding

40. The costs of the chairmanship and Steering Group meetings will be covered by AIC, CLA and NFU. As the GHGAP delivery towards the 2012 milestones gathers

momentum, it is envisaged that to function effectively and to oversee a complex landscape of activity, the Steering Group will require the services of a programme manager or co-ordinator. The industry's experience of other voluntary programmes e.g. Campaign for the Farmed Environment and the Voluntary Initiative on Pesticides, has reinforced the necessity of such a role. This need will be assessed by the GHGAP Steering Group at its first formal meetings and options considered for how this might be delivered.

Action 11: The GHGAP partnership will establish a Steering Group by end January 2011.

Annex A: On-Farm Actions to Reduce Emissions

In order to encourage the continued reduction of GHG emissions from agriculture, it is important to achieve clarity about the on-farm practices that can increase production efficiency and realise GHG emissions reductions per unit production. Experts in the industry partnership organisations have identified a suite of actions to achieve such efficiencies, which are largely based on high-lighting key existing best practice guidance.

Actions for all farm types

1. **Skills, training and advice** - seek appropriate training in land management and the application of crop inputs. If professional advice is sought, use only professionally qualified individuals

2. **Soil management** - follow good practice: avoid and rectify soil structural problems (*e.g.* by reducing wheelings and poaching, by sub-soiling, mole draining, adding organic matter). Use soil cultivations appropriate for the soil type and cropping situation without restricting crop growth and nutrient uptake. Monitor and amend soil nutrient status and pH following regular soil sampling and analysis

3. **Land management risk assessment** - grow crops and locate high output grazing livestock systems on land with characteristics capable of supporting sustainable production (e.g. based on soil type and depth, droughtiness, slope). Review enterprises and cropping that may not be suited to the land (e.g. intensity of dairy stocking; fields for growing milling wheat, potatoes, and vegetables)

4. **Optimise crop and livestock performance** - select varieties and breeds suited to local conditions and market requirements, using the natural environment to best effect, taking a whole farm approach (integrated farm management)

- **Consider selection of crop and animal breeds** which favour production efficiency and GHG mitigation

5. **Crop nutrition (underpinned by crop health)**
- Plan fertiliser and manure applications to each crop to optimise the supply of all nutrients from all sources. Use standard recommendations, and prepare a nutrient and manure application plan for each crop in each year, allowing for nutrient balances within the rotation:

- Make the most of the nutrient resources already available - account for the nutrients supplied from soils and manures.

- Optimise the quantity of nitrogen that is applied as fertiliser and manure N - ensure that all other crop inputs (including other nutrients, lime and crop protection products etc.) are optimised so that unrestricted crop growth is achieved with a high efficiency of nitrogen utilisation. This will reduce the risk of using unnecessarily high nitrogen application rates.

- Apply nitrogen from manufactured fertilisers and organic manures at times that match the crop uptake of nitrogen - avoid applying nitrogen when the soil is waterlogged, frozen or when the crop/grass is not growing. (Precise timings and recommended rates will be crop specific)

- Apply nitrogen and other nutrients at the optimum rate and evenly to the target area. Check and calibrate each fertiliser spreader/sprayer annually before fertiliser is applied and use headland devices. (Consider benefits of GPS technologies, if appropriate). Estimate the weight/volume and rate of application of each type of manure applied to each field

6. **Maximise marketable produce** – harvest/slaughter at optimum times. Handle livestock and crops to minimise losses and damage during transit, storage and processing

7. **Consider opportunities for energy efficiency and renewable energy generation** - in the efficient use and potential for on-site supply of electricity, heat and vehicle and heating fuels

8. **Adopt land management practices/stewardship options** which maximise environmental value, resource protection and carbon storage, e.g. buffer strips on compacted wet headlands offer potential GHG mitigation and carbon sinks

Livestock-specific actions

9. **Skills, training and advice** - consider additional benefit of using a ration formulation programme or nutritional advice from an expert when planning the feeding regime for your livestock

10. **Manure treatment, storage and spreading** - implement manure management practices that will reduce atmospheric emissions and water pollution during manure collection, storage and spreading. Use facilities and techniques which result in the best possible use of nutrients by a growing crop, including adequate slurry and dirty water storage capacity, slurry separation, anaerobic digestion, covered storage, low emission slurry spreading techniques and nutrient management planning

11. **Housing** - provide suitable housing and shelter for livestock appropriate to their needs and those of workers, including welfare, freedom from stress, minimising aerial and atmospheric pollutants, minimising disease pressures, providing optimum access to feed, water, light, shelter and warmth (where appropriate). Utilise materials which will withstand hard use but also do not harbour disease organisms and pathogens

12. **Livestock nutrition** - plan diets and feeding regimes to achieve desired productivity, efficiently making use of resources available including home grown crops and food industry origin co-products, carefully matching nutrient content and availability to animal requirements. Consider using feed technology and additives to improve feed use efficiency

13. **Livestock health** - maintain optimum health status of all livestock through proactive health planning and close monitoring of performance e.g. through weighing of stock to identify need for interventions. Consider the benefit of expert veterinary advice in health planning linked with the appropriate diet, feeding regime and housing for the breed

-consider vaccinations and anti-parasitics where appropriate
(participation in health schemes may raise the value of breeding stock)
-prioritise health and welfare issues, and implement testing for diseases if advised
-implement biosecurity measures

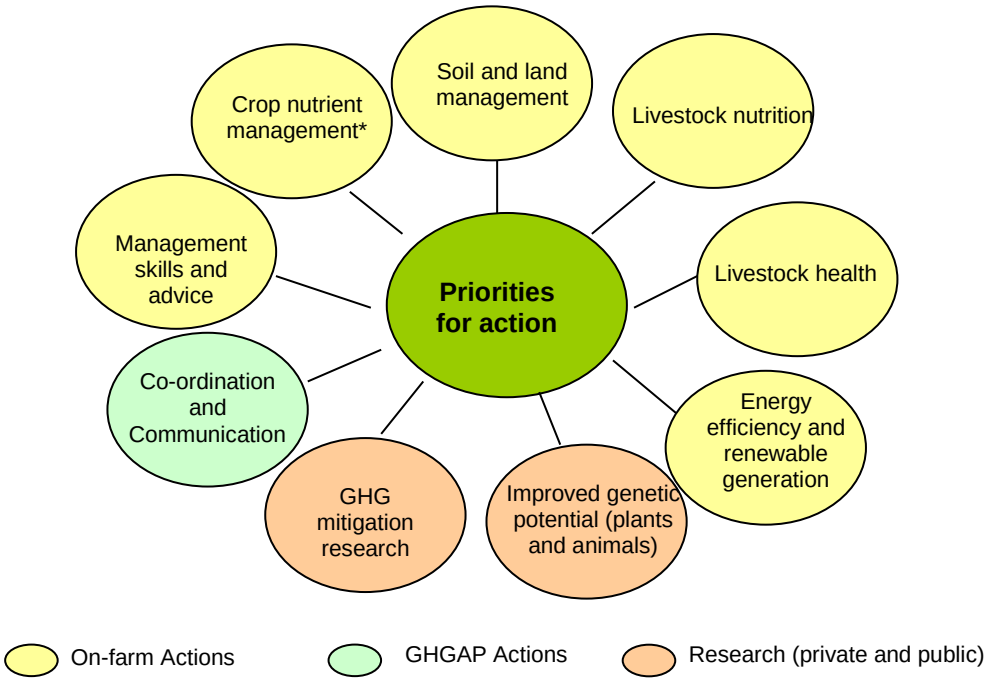
14. **Genetics and breeding policy** - select for traits which will benefit the farming system. Target efficient production and satisfy market needs with respect to products and product quality:

- Use bulls with a high PLI or Profitable Lifetime Index when breeding dairy cows
- Use bulls/rams with a high EBV or Estimated Breeding Value when breeding beef cattle/lamb

15. **Plan grassland management (and forage management)** to meet production objectives - use clover mixes to reduce the need for nitrogen application, high sugar grasses where appropriate, and utilise forage production efficiently

Annex B: Activities to Deliver Each Priority for Action

This annex sets out the details of the current and new activities that will be undertaken to encourage uptake of on-farm actions. They have been grouped into a series of Priority Action Areas as follows:



* Manure/slurry/fertiliser/biological fixation management in grassland and arable production systems - supported by arable crop disease management to optimise marketable crop

Crop Nutrient Management

Priority Action Area	Activity		Delivery channel	Relative indicators of progress (and source of data)
	Current activity	**New activity (by 2014)**		
Crop nutrition	Annual Professional CPD for all FACTS advisers	All advisers required to undertake 6 training modules of management planning training (inc. linking training to N_2O) by Dec 2014 to enhance advice and to retain FACTS status	AIC advisers, AICC, ADAS, NIAB-TAG, all those FACTS qualified working in public sector and in AHDB, FWAG, IOTA	Numbers of advisers completing training and online assessment (verified by records held at BASIS)
	Research to refine fertiliser recommendations for optimum crop performance	Research focus on high N using crops: wheat & OSR for revised N rates and timings for optimal crop performance and N_2O mitigation. Also focus on varietal selection for Nitrogen Use Efficiency (NUE) Focus on new grass & clover swards	Nitrous Oxide Research and KT Consortium (22 partners *) - new findings and mitigation strategies agreed and disseminated from 2014 ADAS mitigation research with HGCA & Knowledge transfer AIC Member companies - all work needed to refine the recommendations of the Fertiliser Manual AIC Member companies	Trends in rates and timings from 2020 - allowing time for uptake of any revised advice (British Survey of Fertiliser Practice (BSFP)) BSFP
	Joint Professional Nutrient Management CSF Campaign: Tried & Tested Management Plan and one stop shop website RB209 Fertiliser	March 2011-13. Focus on gaps in activity: simple tools and messages for livestock farmers not receiving advice: feeding planning, manures guide	AIC, CLA, FWAG, LEAF, NFU and supporters: AHDB sectors EA, and the Professional Agricultural Analysis Group (PAAG) 14 soil labs Also: support from ARLA and Waitrose – using the LEAF Marque and others*	Status report 2010 and 2013: ref uptake of tools and services, supplemented by commercial information Status reports of CSF previous and future - showing multiple benefits of integrated advice

	Recommendations			
		Focus on limiting factors to NUE – pH, S, P and K	FACTS advisers (see above): promotion of soil analysis and renewed confidence in results	Soil analysis reports (PAAG et al) Proficiency Testing reports (from soil labs). Detail from Industry roadmaps, product/whole farm audits
		Validating the use of new products and nitrification inhibitors	AIC Member companies – link with IGER project on inhibitors	Commercial data
		Development of methods for reducing uncertainty of soil N supply and analysis of manures (inc. digestate and biosolids)	AIC Members companies	Uptake of new methods and tools: (BSFP supplementary questions, FPS and commercial activity data)
		Screening of existing varieties for NUE	Information transferred through AIC, AICC, NIAB-TAG, HGCA et al	Monitoring of seed sales (NIAB)
	Campaign for the Farmed Environment	Compacted headland converted to natural habitat	CFE Industry Partners working with Defra and agencies, RSPB and other wildlife orgs.	Calculate estimated N_2O savings from selected non cropped areas and potential carbon sequestration
	Use of whole farm or product (LCA) audits.		CLA, Carbon Trust, AIC Member companies working with supply chain, LEAF, Retailers, ORC, IOTA	Interrogation of databases from these commercial activities
	Encourage uptake and better use of farm manures, composts, sewage sludge	Outputs from strategic research into use of biofertiliser and compost	WRAP, Defra, Zero Waste Scotland Information on use of digestate: International Energy Agency	Potential for monitoring uptake of improved manure management practice (FPS) Potential for monitoring uptake of composts and sewage sludge through FPS/BSFP
	Encourage use of digestate from anaerobic digestion (AD) on farms	Outputs from above research and ongoing work through NNFCC	WRAP, Defra, NNFCC, CLA	Potential for monitoring digestate use through BSFP and NNFCC website

GAPS NOT ADDRESSED IN NEW ACTIVITIES:
Research into enhanced root physiology and generally to increase nutrient use efficiency

The Crop Nutrient Management priority action area is underpinned by continuing improvements in crop protection practice and efficacy. Evidence of improvements made can be provided on CPD of Professional Advisers and Agronomist, through BASIS, evidence of practice, through the Voluntary Initiative for Pesticides, and through public and private sector surveys. Also: look at crop protection programmes on GHG mitigation.

Soil and Land Management

Priority Action Area	Activity		Delivery channel	Relative measures/indicators of progress (and source of data)
	Current activity	**New activity (by 2014)**		
Soil and land management	*Soil Protection Review (for cross compliance) and Soil Management Planning under HLS CFE resource protection	Re-focus advice on soil quality and value of soil analysis Establishing best practice for soil N supply	AIC advisers, AICC, ADAS, NIAB, TAG, ORC, IOTA, SA, all those FACTS qualified working in public sector and in AHDB, FWAG LEAF – also link with Soil Management Initiative	Numbers of soil analysis samples submitted to labs and percentage of relevant farmland area covered (FPS and PAAG data published by PNM Group) Also: account for soil N analysis trends
	Fragmented advice on soil management and methods for reducing compaction and machinery wheelings	Co-ordinate advice, materials and tools through 2nd phase of PNM Group and CSF. Present to multiple orgs, branded messages, inc. cost benefits figures	Via adviser information hub and via PNM Group, Tried& Tested campaign and one-stop-shop website for farmers Via AHDB sector activities and Road maps, FWAG farm visits, Farming Futures	(Hub statistics, PNM Group reports)

Livestock Nutrition

Priority Action Area	Activity		Delivery channel	Relative measures/indicators of progress (and source of data)
	Current activity	**New activity**		
Livestock nutrition		Reworking livestock diets to minimise N,P and C	AIC feed supply companies research and sales. Organic diet formulation advice from IOTA/ORC	
		Enhanced nutritional guidance to those not receiving professional advice	AIC feed supply companies and Tried & Tested programme (FWAG, LEAF, CLA, NFU, AIC and CSF)	Increase in numbers fed to recognised feeding plan/regime (FPS, Assurance Schemes, Tried & Tested survey)
		BPEX Two-Tonne Sow programme: nutrition stream from spring 2011	BPEX KT managers (leaflets, events, website, workshops)	Target: industry average of 2,000kg of pig meat per sow per year by 2012 (BPEX annual report; Pig Environmental Roadmap report)
	DairyCo Feeding + (Phase I)	DairyCo Feeding+ (Phase II)	Advice and detailed Feeding+ folder of information via DairyCo KT Officers (16)	Numbers of farmers attending Feeding+ meetings (DairyCo annual report; Milk Roadmap report)
		DairyCo Milkbench+	Dedicated DairyCo team; Benchmarking tool; KT Officers	Numbers of farmers on Milkbench+ database with target of 350 by end 2011 (DairyCo annual report; Milk Roadmap report)
	EBLEX: Beef Better Returns Programme (BRP) and Sheep BRP	Extended BRPs: wider uptake of nutrition management tools	EBLEX KT extending programme to wider cross-section of herds, increasing participation in events and activities focussed on nutrition etc and cost benefits	Annual performance monitoring (Beef and Sheep annual reports; Beef and Sheep production roadmap report)

	Use of whole farm or product (LCA) audits	Use of revised and improved fertiliser and feed emission factors Development of sustainability assessment tools	CLA, Carbon Trust, AIC Member companies working with supply chain, LEAF, Retailers, ORC, IOTA and SOLID project consortium	Interrogation of databases from these commercial activities

Livestock Health

Priority Action Area	Activity		Delivery channel	Relative measures/indicators of progress (and source of data)
	Current activity	**New activity**		
Livestock health		BPEX Two-Tonne Sow programme: health stream from spring 2011	BPEX KT managers (leaflets, events, website, workshops)	Target: industry average of 2000kg of pig meat per sow per year by 2012 (BPEX annual report; Pig Environmental Roadmap report)
	DairyCo Mastitis control plan		QMMS, DairyCo KT Officers and Nottingham University	750 farms on plan by 2012 (DairyCo annual report; Milk Roadmap report)
		DairyCo Lameness improvement plan (from 2011 tbc)	DairyCo KT Officers	(DairyCo annual report; Milk Roadmap report)
	EBLEX: Beef Better Returns Programme (BRP) and Sheep BRP	Extended BRPs: improving the use of practical animal health management programmes	EBLEX KT extending programme to wider cross-section of herds, increasing participation in events and activities focussed on health etc and cost benefits	Annual performance monitoring (Beef and Sheep annual reports; Beef and Sheep production roadmap report)
	60% forage requirement in diet for organic farms under EU regulation 889/2008	Organic certification bodies will continue to monitor diets on organic farms.	Organic Certification bodies: Soil Association (SA), Organic Farmers and Growers (OF&G) SOLID project consortium	Annual inspection reports/records for organic farms Monitoring performance of farms within SOLIDS project
	Animal Health Plans on organic farms now required under organic standards		SA, OF&G, IOTA: advice on compiling animal health plans	Annual inspection reports/records for organic farms

The GHGAP aims to improve engagement animal health professionals and organisations in-order to better co-ordinate future activity in this area.

Energy Efficiency and Renewables Generation

Priority Action Area	Activity		Delivery channel	Relative measures/indicators of progress (and source of data)
	Current activity	**New activity (by 2014)**		
Energy efficiency and renewable generation	Improved energy efficiency of farm vehicles, equipment and buildings	CT energy efficiency loans: variable rate equipment, buildings, processing and renewable energy supply	All GHGAP delivery partners communications and CT website	
	Increased use of low carbon fuels	Renewable fuel supply (on-site supply and trading between farms)	All GHGAP delivery partners	
	Reduced fuel consumption	Reduced consumption in field operations – advice dissemination	Advice information hub, NFU, CLA, ORC, IOTA, Farming Futures	
	On farm take-up of AD limited by financial viability	Case studies to highlight multiple environmental benefits across a range of size classes	NFU, RASE, Farming Futures, AIC Member company interest	
	Development of biofuel market. Ongoing R&D projects, ADAS, HGCA et al	Cont, R&D and revised emission factors and tools for GHG assessments		
Indirect emissions reductions		50% reduction in N2O emissions from fertiliser manufacture (EU) A further 10% reduction in carbon emissions from feed manufacture	AIC Fertiliser and Animal Feed Producers	Climate Change Agreement results and emission factors published on the EU LCA platform

Management Skills and Advice

Priority Action Area	Activity		Delivery channel	Relative measures/ indicators of progress (and source of data)
	Current activity	**New activity (by 2014)**		
Management skills and advice	Annual Professional CPD for all FACTS advisers	All advisers required to undertake 6 training modules of management planning training (inc. linking training to N_2O) by Dec 2014 to enhance advice and to retain FACTS status	AIC advisers, AICC, ADAS, NIAB-TAG, all those FACTS qualified working in public sector and in AHDB, FWAG	Numbers of advisers completing training and online assessment (verified by records held at BASIS)
	Animal feed nutritionist qualifications and feed rep training	Wider GHG mitigation information made available to feed supply industry for in-house training – linking productivity drivers with GHG reductions (using iHub if it is established)	AIC Animal Feed nutritionist	Distribution and feedback statistics
		Provision of relevant information to professional veterinary bodies, government agencies	Via the current alliance of animal health organisations: RUMA – responsible use of medicines in agriculture alliance	Distribution and feedback statistics
		Provision of information to institutes of higher education	Defra	Distribution and feedback statistics

Improved Genetic Potential

Priority action area		**Activity**		**Delivery channel**	**Relative measures/indicators of progress (and source of data)**
		Current activity	**New activity (by 2014)**		
Improved genetic potential	Crops	Research into NUE of wheat and legume breeding ongoing Research into new grass swards inc. high sugar grasses, ongoing	Selection of existing varieties for characteristics favourable for nutrient use efficiency for various management systems	All delivery partners	
	Animals	Research into farrowing systems, artificial insemination for pigs, dairy cow genetics, sheep screening, ongoing	Within the parameters of the farming system, selection of breeds for production efficiency	All delivery partners	

GHG Mitigation Research

R&D supporting improved farming practice for efficiency of resource use: soil, nutrients and energy usage, and renewable energy generation

Priority action area		**Activity**		**Delivery channel**	**Relative measures/indicators of progress (and source of data)**
		Current activity	**New activity (by 2014)**		
GHG mitigation research	Soil and land management	SNS assessments – as for current in Fertiliser Manual	Improved soil nitrogen assessments for forage maize	AIC	
		Development of guides and tools for reducing soil compaction – poaching/traffic wheelings	Relationship between soil conditions and nitrous oxide emissions	Soil Management Initiative partners AIC, Potato Council	
	Crop nutrition	Revised nitrogen guidelines for wheat growers	Screening existing wheat and OSR varieties for N efficiency	ADAS where main funder is HGCA, DairyCo, plant breeders, biofuels industry, other GHG Action Plan industry partners, et al	
		Improving biofuel GHG emission calculations	Analysis of wheat varieties for biofuel		
		Evaluating triticale/cereal varieties for GHG benefit	Arable crop mitigation strategies	AIC, NIAB, TAG, Potato	
		N timings for bioethanol production			
		Ongoing fertiliser response trials	Refining fertiliser recommendations for NUE inc. reducing uncertainties of organic contributions	AIC	

		Ongoing fertiliser testing and calibration Trials on nitrification inhibitors ongoing	Inc: trials on new grass, clover swards, and legumes Value of sulphur for NUE and grass protein quality Development of analysis methods (inc. rapid) for organic materials	AIC, Potato Council	
	Livestock nutrition	Optimal livestock feeding trials ongoing: dairy, pigs, sheep Development of forage based and compound feeding for different farming systems	Evaluation of alternative/reduced protein and feed conversion efficiency work for productivity gains: dairy, pigs, sheep Manipulation of feeding/finishing regimes to reduce GHGs Analysis of oat varieties to reduce GHG emissions from ruminants and crop protection Review of recommended lists of grasses and clover	BPEX, EBLEX, DairyCo and AIC Member companies, ORC and organic and low input research project partners	
	Livestock Health	Ongoing research into Johne's disease, control of worms sustainably, disease and welfare Integrated animal welfare assessment & development of European standards	Training for vets in welfare	BPEX, EBLEX, DairyCo and in liaison with RUMA (Responsible Use of Medicines in Agriculture ORC and organic and low input research project partners	
	Energy savings		Assessing the suitability of energy-efficient lighting systems	HDC, BPEX	

			Further development of efficient ducted-air heating/ventilating systems Researching peat replacement growth medium		
	Organic –specific advice on GHG reduction	England wide information portal	Improving the GHG performance of organic systems through advice	ORC, IOTA, SA	