



Meeting the Challenge:

Agriculture Industry GHG Action Plan

**Delivery of Phase I:
2010 – 2012**

Interim report 31st July 2011

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Executive summary

The agriculture sector is committed to playing its part in contributing to meeting the UK national goal of an overall 80% reduction in greenhouse gas (GHG) emissions by 2050. The initial focus of the agriculture industry Greenhouse Gas Action Plan (GHGAP) to 2020 is to promote production efficiency, since this will both yield significant GHG savings and result in more robust farm businesses.

The GHGAP aims to use existing trusted delivery routes where possible. For example, recently published AHDB “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 reduce the duplication of effort across the partnership.

The GHGAP Steering Group (SG) has made progress with many of its objectives. A draft specification for an Information Hub (iHub) to help advisors (primarily) deliver consistent messages has been written. Currently, a potential pilot of the iHub, utilising an existing web-based system, is under consideration.

Members of the SG have also represented the GHGAP at Defra Food Supply Chain Mitigation group meetings. A series of Autumn 2011 ‘road-shows’ will engage key organisations within the supply chain and influencers elsewhere e.g. farming press and regulators.

Introduction

1. In response to the previous 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 CO₂-equivalent (Mt CO₂e) by the third carbon budget period (2018 – 2022).
2. The first phase Delivery Plan¹ launched in April 2011 set out the initial steps of an ambitious long-term programme of work that the partnership of English agriculture industry organisations will take to meet the 3Mt CO₂e reduction target.
3. Its objectives were to establish a robust partnership to improve awareness amongst farmers and growers of GHG emissions and drive the implementation of on-farm practices that reduce GHG emissions per unit of production, in a manner that also promotes animal health and welfare and environmental protection. The GHGAP also aimed to work effectively with the GHG Data Management and Modelling Project funded by government (AC0114) so that progress in reducing GHG emissions in the agriculture sector can be monitored and reported over time.
4. To achieve these objectives, key activities were identified by the partnership:
 - Improve co-ordination of advice and information so that advisory networks serving different farming sectors deliver consistent and up to date messages.
 - Consider developing an Information Hub (iHub), which will allow the sourcing of common messages and materials
 - Develop a communications strategy 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.
 - Continue to develop and promote farm audit approaches to help raise awareness and inform the decision making of farming businesses
 - Continue to enhance the supporting evidence base, through working closely with Defra and research organisations to identify data sources and gaps, and prioritise the science and knowledge exchange investment needs of the sector.
 - Develop case studies and cost:benefit evidence to promote on-farm actions
 - Participate actively in Defra's Integrated Advice Pilot project and continue to work with Defra to improve training and skills strategies.

This document reports on specific industry actions to deliver these key activities.

¹ www.nfuonline.com/ghgap

GHGAP Progress

5. The table below summarises the progress made against the specific actions identified in the first phase GHGAP. Further detail on particular actions is provided after the table.

Actions set out in the first phase delivery of the GHGAP

Action	Target Date	Progress (to July 2011)
iHub		
Action 1: AHDB to undertake feasibility study to assess need for iHub and possible options, to inform a GHGAP Steering Group decision on implementing a pilot.	by end April 2011	Completed 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	On-going (iHub specification completed and resources determined)
Communications Strategy		
Action 3: GHGAP SG members to continue liaison with other farming organisations, service providers and their networks. Establish links with trade press.	On-going	About 60 representatives of agriculture and food industry attended GHGAP launch in April. Series of stakeholder engagement 'road-shows' to start in Autumn 2011.
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 on-going	Members of SG attend Defra's Food Supply Chain Mitigation Group. Series of stakeholder engagement 'road-shows' to start in Autumn 2011.
Action 5: GHGAP Steering Group to identify sectors where biggest efficiency gains can be made and map out current reach of existing networks.	by end April 2011	On-going
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	Common Powerpoint presentation and leaflet with initial key messages complete. This will be updated with time.
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	Clarification on possible Defra project in this area being sought.
Action 8: GHGAP Steering Group to develop concept of branding of advice.	by end October 2011	Logo and leaflet completed by April 2011. Co-branding of new material will be default for SG organisations (see example in Annex 1).
Industry Sector Training Initiatives		
Training for advisors delivering climate change related advice and messages will be integrated into new FACTS		Since introduction in 2010, 668 FACTS Qualified Advisers have

courses	by end March 2012	taken new CPD training covering Nutrient Management Planning and including nitrous oxide mitigation
GHG advice, messages and information made available to vets (via BVA, BCVA BSVA, RUMA etc), animal nutrition advisors and feed representatives		AIC formed Feed Carbon Group. Its remit includes the feed sector' contribution to the GHGAP. A strategy is in preparation.
Demonstration Farms actively promoting the key on-farm actions set out in this Delivery Plan		Existing network of Demonstration farms being utilised e.g. LEAF, NIAB-TAG
Identify standards in assurance schemes that will benefit GHG mitigation and develop options for how these can be enhanced to support GHGAP delivery.		Initial discussions with Assured Food Standards completed by July 2011. Initial process for assessing potential contribution from the schemes agreed.
Governance and Monitoring Progress		
Action 9: Reporting progress: <ul style="list-style-type: none"> Interim progress report to Secretary of State Annual GHGAP progress report to Secretary of State 	by end July 2011 by end April 2012	Submitted Clarification being sought from Defra on exact date of submission.
Action 10: Work closely with GHG Data Modelling and Management 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	A member of the Data Modelling and Management team sits on the GHGAP Steering Group (SG). Initial discussions on availability and sharing of data complete. Collaborating on supply chain engagement.
Action 11: Establishment of fully representative Steering Group.	by end January 2011	First fully constituted SG meeting chaired by NFU/CLA officeholder held in April after the launch of the Plan.

Consideration of an Information Hub (Actions 1 and 2)

6. The concept of an information hub (iHub) would deliver a repository of information on production efficiencies and GHG mitigation through common messages, guidelines, technical material and scientific publications. The AHDB produced a feasibility study (Action 1) on the iHub for consideration by GHGAP SG on April 4th when the decision was taken to commence with the next steps towards its development.
7. A number of advantages were identified:
 - Greater consistency in advice provision
 - Less duplication of effort in collating resources, tracking version updates and accessing materials (industry in-kind resource requirements will be significant in creating, piloting and running the hub.)
 - Easy electronic access to quality assured materials that are freely available
 - Offering universal access to all information so facilitating maximum value from each farm visit
 - An opportunity for greater collaboration in the creation of new materials and advice
 - Transparency in peer review of new scientific findings and their application

Specification, hosting and resource requirements

8. An iHub sub group has taken the work forward, producing a specification for a pilot system (see annex 2). The sub-group took the view that there was merit in the proposed iHub being hosted and managed by an organisation which was not part of the GHG Action Plan. This would dispel any concerns about one particular organisation asserting dominance in the context of the Plan's delivery.
9. Sub-group examination of the range of electronic information centres currently available identified Harper Adams University College (HAUC)'s Openfields² system as the likely candidate to host the iHub. Openfields offers an extant electronic library system which can be used as a platform for the iHub development. HAUC has the added advantage of independence and relative organisational stability. However, the sub-group has recognised the value of avoiding duplication and so will investigate the potential to co-operate with and potentially link the iHub to other existing electronic repositories.
10. Whilst the sub-group are on track to meet the timeline for Action 2 and have a pilot ready for testing in April 2012, the entire SG believes it is more important to establish the right structure and resource at the start, to help secure success. It is likely that the pilot would need to run for up-to 3 years to establish its profile and assess its value.
11. Whilst building upon an existing system offers considerable value for money, resource will be required to ensure that the iHub is fit-for purpose. The sub-

² <http://www.openfields.org.uk/>

group is in the process of identifying the required resource. SG members will be playing an active role in assessing existing resource materials, identifying new science and information, undertaking peer review to ensure quality, as necessary, and directing the development of the iHub.

12. It is envisaged that the setting-up of the pilot, populating the iHub with material and running its development and maintenance would fit well with the role of a proposed GHGAP co-ordinator. Potential in-kind and financial contributions from GHGAP partners are under consideration in order to define the role and resource available for the creation and maintenance of the iHub, and for co-ordinating SG activities.

Communications strategy (actions 3 – 6)

13. Communication is vital to the GHGAP achieving its objectives, particularly by raising awareness of GHG emissions and in delivering advice and technical support that enables the implementation of the priority on-farm actions (see Annex 3).

Ensuring clear operational communications with partner organisations (Actions 3 and 4)

14. Since the launch of the GHGAP in April 2011, much of the work of the GHGAP SG has focussed on increasing awareness and improved organisation of ‘internal’ communications activities (see following section) and on the iHub. With the foundations of these two areas of work now in place, the SG can turn its attention to the strengthening links with and gaining the support of other service providers (see case study below), the trade press and the supply chain for the GHGAP’s on-farm actions.

The strength of collaborative networks

A new Catchment Sensitive Farming strategic partnership agreement has been signed between five GHGAP Partners and Natural England, with support from AHDB sectors and others, for delivery. Two years of activity, including press and communications have been determined – to support the overall quality of nutrient resource management on farms, and whilst facilitating the common aim of reducing the nitrogen surplus at risk of loss as nitrate, ammonia, and nitrous oxide.

15. The GHGAP has intentionally kept a low media profile in order to avoid confusion and “initiative and information overload” amongst farmers and other primary audiences. However this has led to some confusion about the GHGAP and its objectives. An ‘external’ engagement campaign will therefore help clear up any misunderstanding.

16. The GHGAP will begin its stakeholder engagement programme in the autumn with a series of 'road-shows' initially targeting the farming trade press, the Environment Agency, Natural England and representative associations and individual organisations in the supply chain. Although some members of the GHGAP sit on Defra's Food Supply Chain Mitigation group, the SG agreed at its last meeting in July that direct engagement was necessary in order to deliver fruitful long-term relationships.
17. The influence of the food and biofuel supply chains in GHG mitigation has been most evident from the plethora of activity in the carbon footprinting of products. Drivers include the Renewable Energy Directive requiring sustainability criteria for oilseed rape and wheat for biofuel, environmental footprinting of barley to meet the requirements of maltsters, and leading retailers' and major food processors' conditions for other products e.g. potatoes, milk *etc.* for their integrated supply chains.

Awareness about GHG mitigation (Actions 5 and 6)

18. The GHGAP partnership has offered an opportunity to use the expertise of the participating organisations to provide a strategic overview of the delivery landscape. The SG has mapped out the reach of existing networks and aims to use them more effectively to improve the overall level of awareness. It was considered important to prioritise activity on the basis of where the greatest progress in GHG emissions reductions could be achieved in given sectors, thus enabling effective targeting of existing resources.
19. The GHGAP work-plan has therefore delivered a common strategic understanding of how initiatives already planned for 2011-2012 fit with and contribute to achieving the objectives of the GHGAP (see example in Annex 4). The work-plan covers all of the GHGAP's priorities for action.
20. The work-plan will facilitate the identification of opportunities for collaboration on GHGAP priorities, with SG members providing additional communications support to already planned communications initiatives e.g. synergies between HGCA's soil sampling campaign in September and FWAG's soil testing work in October.
21. It will also enable the identification of gaps in delivery so that future plans can be put in place to address these. Work to fill some gaps is already underway (see following case study).

Priorities for action



Filling in the delivery gaps

- As part of the Strategic Nutrient Management Partnership with Natural England, funds and in-kind resources have been allocated to produce a simple guide to feed nutrient planning, specifically targeted at those farmers who do not receive specialist advice. The new Feed Management Plan (for dairy, beef and sheep) will be linked to health planning and will be promoted through the Tried & Tested Nutrient Management Campaign³. All relevant GHG Steering Group Partners will be involved in the co-ordinated communications and advisory effort. The outputs from Defra project (FFG 1101) Feed Management on Livestock Farms, will be used to inform the process.
- The Tried & Tested Campaign is also developing new resources and a communications campaign targeted at farmers handling manures in particular and those new to nutrient management planning.

Industry sector training initiatives

Six new training modules in support of updated Crop Nutrient Management Planning Advice

22. Recognising the pivotal role that FACTS Qualified Advisers have in promoting improvement in the quality of crop nutrient management on-farms, and the link with GHG mitigation, a new set of Continued Professional Development training modules were introduced by FACTS, in 2010. The syllabus⁴ anticipates the skills and knowledge that these professionally registered advisers will need to help farmers improve the efficiency of nitrogen use, and mitigate nitrous oxide emissions, as part of an integrated farm advice package.
23. All FACTS Qualified Advisers (FQAs) are required to undertake this training by the end of 2014, in order to retain their professional status. 668 FQAs have taken the training so far, 56 have attended the Train the Trainer course so the rate of training appears on track.
24. All FACTS Trainers and FACTS Information Service subscribers have received a copy of the GHGAP. Their attention has been drawn to their strong role in the delivery of the 15 on-farm actions (actions 2, 5, 10 and 15, in particular).

Advances in feed management planning and ration plan

25. Most companies in the animal feed supply sector already appreciate the value of in-house training, and some are developing their staff competence to enable them to advise the farmer of the benefits of a whole farm approach to using nutrients more efficiently *i.e.* balancing feed and fertiliser inputs. However

³ <http://www.nutrientmanagement.org>

⁴ <http://www.basis-reg.com/agriculture/factstraining.aspx>

these established and more recent investments in staff training are not formally recognised. Until now there has been no obvious advantage to the industry in training transparency.

26. While there is no certification scheme, in this sector, a new Feed Carbon Group has been established within AIC to co-ordinate the contribution that the animal feed nutritionists and feed merchants can make to the GHGAP. Its strategy will be announced in 2012.
27. The feed sector is active in making advances in feed formulations. This is a highly competitive and progressive field. Further details will be provided in the 2012 GHGAP report.

Soil Management training

28. BASIS already offers a Soil and Water course, designed with nutrient and pesticide loss in mind. The syllabus will be kept under review in the context of nitrous oxide, in light of new research, and in response to the initiative of the British Society of Soil Scientists, launched in July⁵. The aim is to offer leadership in training and skills in the area of soil management, for all industries – also arguably, the most significant factor in terms of nitrous oxide emissions.

Governance and monitoring progress (Actions 9 - 11)

Governance

29. The development of the GHGAP has involved a significant number of partner organisations and the Steering Group (SG)⁶ reflects the breadth of GHGAP activities.
30. The GHGAP SG has met formally with a CLA or NFU officeholder chair twice since the launch in April 2011 to review progress and stimulate action. A senior member of the DEFRA climate change mitigation team sits on the Steering Group to reflect the Government position, observe progress and support the work of the GHGAP as appropriate. A sub-group was set up to lead work on the iHub (reported in a previous section). Members of the SG have also met in a “technical mode” to address technical or communication issues in more detail. The outputs of such meetings are discussed with the entire SG to ensure collective approval.
31. The costs of the chairmanship and SG meetings are being covered by AIC, CLA and NFU. However the SG believes that to function effectively and to oversee the complex landscape of activity the services of a programme manager or co-ordinator is still required. The Steering Group is currently considering the job specification in conjunction with the development and maintenance of the iHub.

⁵ www.soilscientist.org/workingwithsoil

⁶ ADAS, AEA, AHDB, AIC, BPC, CLA, FWAG, LEAF, NFU, NIAB/TAG, ORC

Monitoring progress

32. Links between SG members and Defra's Data Management project (AC 0114) are established and a successful active working relationship has been formed in support of the specific tasks outlined in the project work packages. The SG has achieved consensus regarding the approach for monitoring progress and will remain involved in the process for the duration of the project AC 0114 and beyond.

Next steps to 2012 and beyond

33. Over the next year to the progress review in 2012 the GHGAP will focus its efforts on piloting the iHub and on communicating with farmers and their influencers. To drive the delivery of these objectives, the SG believes that a co-ordinator is critical. Once the extent of the SG contribution (in-kind and financial) is established, potential sources for co-funding will be explored.
34. While government investment in improving the evidence base for GHG emissions indicators is recognised and welcomed, the GHGAP is acutely aware that much on-farm activity could remain undetected and unquantifiable. Capturing the fine-grained information is a longer-term aim, which will be considered in the process of working with Defra's Data Management project.
35. The GHGAP is making the first steps to promoting integration - of messaging, advice - across the SG and the wider supply chain. Although focussed on GHG mitigation, the GHGAP believes that in the longer-term its activities could provide the catalyst for change across the entire industry - in the way that it works, communicates and delivers shared messages.

Annex 1: GHGAP co-branding at Cereals 2011



Annex 2: iHub specification

Specification for an electronic repository of technical and policy-related information of relevance to the net reduction in greenhouse gas (GHG) emissions from UK agriculture and horticulture – the so-called “iHub”

1. This paper reflects the thoughts of a Sub-group of the Greenhouse Gas Action Plan Steering Group that was established to consider options for developing an iHub as an important aid to organising and delivering technical information on GHG emissions from UK agriculture and horticulture together with means whereby they could be reduced.
2. The consensus of the Sub-group was that the iHub needed to enable access to original papers and reports in addition to derived documents written for advisers and farmers/growers. In addition, the Sub-group considered that the iHub needed to be planned to stand the test of time; GHG emissions reduction would be a live issue for decades. Longevity would be most likely if the iHub was housed with an organisation and on an IT platform where long-term security and management was least likely to be disrupted by political or economic factors.
3. The Sub-group took the view that there was merit in the proposed iHub being hosted and managed by an organisation which was not part of the GHG Action Plan Consortium. This would dispel any concerns about one particular Consortium organisation gaining a higher profile or more dominant presence than another in the context of Action Plan delivery.
4. It was acknowledged that the iHub could only be developed and supported if new financial resource was forthcoming and a key next step was to determine what the scale of the resource requirement might be. In this context it was acknowledged that commencing the design and build of a system from scratch would almost certainly be more costly than seeking to integrate Consortium requirements within an extant system. For this reason, it was decided, in the first instance, to explore the option of utilising the Harper Adams University College (HAUC) “Open Fields” on-line “library” as a potential vehicle in which the iHub could be housed. Of all the likely candidate organisations that might host the iHub, it was also considered that HAUC was the one that would be least vulnerable to major economic or political disruption (see para 2 above).
5. There follows a set of specifications that the Sub-group determined that the iHub should ideally be able to meet
 - a. A searchable repository for documentation of relevance to GHG emissions reduction from UK agriculture and horticulture including related subjects such as renewable energy generation and carbon capture and storage (CCS) in trees and soil.
 - b. The emphasis would be on primary production before the farm gate but crop handling and storage should also feature.
 - c. The iHub should enable free usage to all users and would not have any restrictions of use.
 - d. The primary user at which the system would preferentially be directed would be the farm “advisor” and large, technically aware farming businesses. However, material prepared to convey information and advice to farmers in general as well as “higher-level” technical information should also be held.

- e. The content should include “packaged” technical information, derived from primary papers and reports and configured for the primary users (see above) as well as the primary literature on which this information was founded. In creating the iHub the former would probably take priority over the latter in establishing and “piloting” the system.
 - f. The iHub should also contain all relevant documents collected together over time which seek to inform the subject of GHG emissions (and their reduction). However, a “flag” mechanism will be required for those documents on which the key messages conveyed to the industry by Consortium members are based. This will distinguish these documents from those which, for whatever reason, have not been used for derivation of advisory messages. “Flagged” documents could usefully be sorted and classified so that they are linked or associated with the higher level advice and guidance (e.g. initial 15 on-farm actions, sector, or mitigation approach)? In this way advisers can more easily find, use and perhaps quote the supporting science (body of evidence) behind their advice.
 - g. The iHub would also be a repository for relevant policy documents and reports as well as technical literature. These policy documents would also be “flagged” if they related directly to the development and operation of the Voluntary Action Plan (or anything that might succeed it).
 - h. The structure of the iHub should take account of the different approaches being adopted to achieve Climate Change mitigation (GHG emissions reduction; fossil fuel substitution; and CCS). In addition the structure should take account of different sectors of agriculture and horticulture (arable, pigs, dairy cattle etc...). It should also be searchable on the basis of the current (or future) Consortium-recommended “on-farm actions” - of which there are fifteen at present. A 3-D matrix is envisaged where particular items may exist in one or more locations.
 - i. Clear navigation tools will be required so the user knows precisely where they are in the system and the status of the documents they are viewing.
 - j. The iHub is not expected to provide access to the various decisions tools and decision support systems that have been created to assist farmers and growers adopt good practice of relevance to GHG emissions reduction. However, signposts or links to the location of relevant tools will need to be provided from key documents in the iHub
 - k. It is expected that documentation emanating from individual members of the GHGAP Consortium will still be accessible from these organisations’ websites but that all consortium websites will provide clear links to the iHub as a source of a wider range of relevant, quality assured information and advice.
6. In addition to considering the functionality of the iHub, the Sub-group also discussed the process of peer review, Quality Assurance (QA) and Quality Control (QC). It was agreed that this should be the shared responsibility of members of the Consortium supplemented by “external” expert opinion. A small high-level group of “gate-keepers” was envisaged and time spent by Consortium members on reading, appraising and developing searchable abstracts for documents to enter the iHub would likely be an important “in kind” contribution to the resources required to make the iHub operational. In this context, primary papers and reports would likely require a different review and “recommendation” process to derived documents designed and written for advisers and farmers. Process for updating and revising advisory documents as new information emerged would also be required. In cases, where the updates are managed outside the Consortium, the Consortium will communicate its recommendations, as appropriate.

Annex 3: 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 – e.g. consider additional benefit of using a ration formulation programme or nutritional advice from an expert when planning the feeding regime for your livestock, use genetic selection tools when purchasing breeding stock, actively manage the livestock health risks on your farm

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 4: Example from GHGAP work-plan for 2011-2012: activities to promote the priority area of improved management and skills and quality of advice

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Management, skills & advice			GHGAP workplan 2011-2012									
2		may	jun	jul	aug	sept	oct	nov	dec	jan	feb	mar	apr
4	AEA			Tractor selection/optimal usage advice									
5	AHDB - BPEX	H&S training Cedar Associates Mgt	H&S SHAD Pig Day										
6	AHDB - BPEX	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT	2 tonne sow KT
7	AHDB - BPEX	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan	Mastitis Control Plan
8	AHDB - DairyCo					Planning for Profit workshops	Planning for Profit workshops	Planning for Profit workshops	Planning for Profit workshops	Planning for Profit workshops	Planning for Profit workshops	Planning for Profit workshops	Planning for Profit workshops
9	AHDB - DairyCo	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+	Milkbench+
10	AHDB - DairyCo	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion	Business Discussion
11	AHDB - DairyCo	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly
12	AHDB - DairyCo											Integrated Advice Pilot	
13	AHDB - EBLEX	Farmax feed planning project	Uplands conference	Progressive beef and sheep groups visit	Market lamb selection roadshow	Finishing options for dairy calves at Dairy Event	Business oostings & C footprinting	Feed planning	Feed planning	Feed planning	Feed planning	Feed planning	Feed planning
14	AHDB - EBLEX				Bedding materials options		College lecturers day						
15	AHDB - HDC	see energy efficiency											
16	AHDB - HGCA	Grassland & Muck	Cereals (15th-16th)	Cereals in Practice	Autumn cultivations	Tillage event	Sulphur application press	AgriScot	Agonomists Conference	Phosphate	Auto-N press article	Legume benefits info sheet	
17	AHDB - HGCA	Promote NIRS	Open Days (ADAS, TAG, Broom's Barn)	Open days (SAC, PGRO)			Soil management workshop with	Tramline management			Agromony Workshops		
18	AHDB - HGCA		Resource Use Efficiency press article	National Organic Cereals									
19	AHDB - Potato Council		Crop impact/ sustainability (report)	Crop impact/ sustainability (report)				British Potato 2011 - general mgt advice					
20	AIC						FACTS			FACTS			
21	LEAF	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work	on-going work
22	NIAB-TAG	Farming systems events	Farming systems events										

The colour scheme reflects the various modes of communication e.g. blue = workshops and open-days, yellow = campaigns