

Question 5 *In the area(s) of your expertise, what are the opportunities and challenges in reducing emissions to 2032, and at what cost? What may be required by 2032 to prepare for the 2050 target, recognising that this may require that emissions in some areas are reduced close to zero?*

Continued policy and regulatory support for land-based renewables will enable agriculture to remain profitable and more resilient to climate change. Accelerated introduction of new technologies and investment in farm infrastructure for agricultural production will be needed. We understand the CCC is currently re-assessing its MACCs framework for agriculture. The agricultural sector may merit a consideration of more futuristic ideas that presently have no cost basis. In addition, the MACC curves do not capture the wider environmental and social implications of climate change mitigation in addition to the interactions and potential trade-offs between specific measures.

The Greenhouse Gas Action Plan workshop on future mitigation potential identified a range of possible measures to deliver GHG reduction in the 2020s and beyond. It was felt that a consortium of researchers should be funded to take the work forward to assess the potential for mitigation and implementation. Additional mitigation measures beyond 2030 were fewer in number with generally less certainty about their applicability or mitigation potential. The range of stakeholders present also asked questions about the robustness of the link between farm profitability and existing greenhouse gas mitigation options. It is clear that there is enormous variability in emissions intensity that varies with context.

The workshop also identified a number of gaps in research and knowledge which are fundamental to current and future mitigation measures. Elsewhere the CCC has identified avoiding nitrogen excess and use of more nitrogen-efficient pasture and crop plants as abatement options for the 4th carbon budget. Yet the workshop recognised that there is a need to better understand the basics of agricultural practices (e.g. the use of innovative fertiliser technologies *etc.*) to maximise nutrient use efficiency. It was also highlighted that there is scientific uncertainty about how to reliably “measure” improved nitrogen-use efficiency in crops/pasture because of the complex nature of this genetic trait.

Difficult decisions on solutions already available like first generation biofuels need to be based on sound evidence rather flawed perception. To quote a recent IEA Bioenergy workshop in Brussels In October 2014 “food-versus-fuel reports that initiated the work on sustainability and iLUC in particular, which were not scientifically robust, should no longer be part of the general discourse.”

The government and the CCC should re-consider the basis of their carbon pricing estimates for the cost-effectiveness of measures to 2030.

Question 7 *Is there evidence to suggest that actions to further reduce emissions after 2032 are likely to be more or less challenging to achieve than actions in the period up to 2032?*

Scientific evidence amassed so far by the NFU and other signatories of the agricultural Greenhouse Gas Action Plan indicates that there is most probably an ultimate limit to GHG reductions from agriculture, bearing in mind the physical and biological constraints of what will remain a predominantly outdoor production process as well as consumer concerns about the shape of the countryside. Like many sectors, agriculture may face a steeper trajectory of GHG emissions reduction after 2032 rather than before that date. As stated elsewhere in this response, additional mitigation measures beyond 2030 put forward at the GHGAP workshop were fewer in number with generally less certainty about their applicability or mitigation potential.

Climatic impacts post 2032 may also limit mitigation potential. The workshop felt that there was limited understanding of the abatement potential for agriculture under the range of potential future climates.

Question 11 *What challenges and opportunities do carbon budgets bring, including in relation to your ability to compete internationally? What evidence do you have for this from your experience of carbon budgets to date?*

To date, much of the agricultural initiative on meeting carbon budgets has been based upon improvements in business resource efficiency. This ought to give our members' businesses a comparative advantage against their EU and global competitors on top of any advantage based on natural resource (maintaining strategic capacity e.g. in dairy, beef and sheep). However, the basis for estimating UK agricultural GHG emissions is still subject to revision, so it remains difficult to assess our progress in meeting previous carbon budgets.

Question 15 *Is there anything else not covered in your answers to previous questions that you would like to add?*

ANSWER:

Improvements in nutrient efficiency will see multiple environmental benefits i.e. reducing nitrate and phosphorus losses to water and ammonia emissions to the air in addition to reducing GHG emissions from agriculture which will be important to reduce agriculture's environmental footprint and meet the requirements of EU Directives (e.g. Water Framework and National Emissions Ceiling Directives).

We are aware of a number of opportunities to reduce GHGs from the UK's food and drink supply that require a co-ordinated and integrated approach across the entire supply chain. Examples include reducing food waste, understanding supply chain specifications, better carcass utilisation and changing manufacturing processes. The GHGAP has been working in collaboration with WRAP's Product Sustainability Forum on some of these options but this area requires further consideration.

