Written evidence from Games & Wildlife Conservation Trust (GWCT) (MET0025)

The GWCT[1] welcomes the opportunity to contribute to this inquiry given that we are concerned about the policy focus on improving carbon storage and sequestration often overlooking the consequences for other gases such as methane and nitrous oxide.

Given our research and conservation remit we have responded to some of the questions in the ToR although our answers will overlap with some of the other considerations raised. However, we also make some general points which we feel are important context.

Overview

1. **Context is important**

Greenhouse gas emissions of anthropogenic origin consist of both long-lived and short-lived pollutants. Any focus on Short-lived Climate Pollutants (SLCPs) such as methane (CH_4) and offsetting measures should not detract from the need to reduce long-lived pollutants especially carbon dioxide emissions.

However, policy has to date tended to focus on reducing carbon dioxide emissions and increasing carbon sequestration, given its longevity, and this has, to a degree, distorted the policy picture in two respects.

Focussing on just one pollutant, carbon dioxide, and defining the effects of others in terms of its short life of 100 years has meant that some of the consequences of policy measures to address carbon can be unintended as they have not been adequately accounted for. In the section on data, measurement and monitoring we comment on this further. But this focus has a second implication. It impacts on the viable management of our habitats for other public goods and services such as biodiversity conservation. The simplest example being the policy support for minimising the use of prescribed burning to manage our peatlands (thereby reducing carbon emissions) in favour of rewetting (which results in an increase in methane emissions[i]). Long term research is also suggesting that cutting as an alternative to prescribed burning (again to limit carbon emissions) may change the vegetative composition of our uplands in favour of sedges which emit methane[ii]. Reduced vegetation management can have more significant consequences for GHG emissions as discussed in trade-offs below.

In addition, as the agriculture sector is the largest contributor to UK methane emissions (49.2% of total UK methane emissions in 2022) it is not surprising that it comes under the spotlight. But this needs to be balanced with other

[1] The Game & Wildlife Conservation Trust (GWCT) is a leading UK charity conducting conservation science to enhance the British countryside for public benefit. For over 90 years we have been researching and developing game and wildlife management techniques. We use our research to provide training and advice on how best to improve the biodiversity of the countryside. www.gwct.org.uk

benefits delivered by this land use, principally food production and security (a point acknowledged by Q20), carbon storage and biodiversity conservation. Changing the management of a land use will have implications for the delivery of these wider benefits and so it is important that methane emissions from agriculture are placed in this context. Significantly, unlike some other significant sources of methane emissions such as waste and gas production which are purely consumptive, agriculture provides both consumptive and non-consumptive benefits.

In summary, as with all policy approaches to environmental conditions, there needs to be balance and adaptation. A full comparative risk assessment which takes into account each climate pollutant is needed for each mitigation approach. This will ensure a more balanced response and support holistically sustainable food systems. Alongside that, on-going monitoring and scientific research is needed to ensure that policy can adapt to changes in both our understanding of climate feedback cycles and net gaseous exchanges and our ability to mitigate them.

2. **Trade-offs** Some examples:
   - Natural emissions from wetlands and peatlands – these are a trade-off with the anthropogenic sources but importantly when part of a conservation initiative to restore currently degraded peatlands will become relevant. Abdalla[iii] estimated that methane emissions from natural northern peatlands varied significantly with the overall annual average (mean ± SD) of 12 ± 21 g C m−2 year−1.

   - Biochar – is considered a potential means of both absorbing methane (see Q16) and improving the carbon sequestration properties of some agricultural soils. However, a potential trade off could be the influence that these applications have on the efficacy and environmental fate of other inputs to the farming system such as residual herbicides, which act on germinating weed seeds[iv]. Surface applied biochar has been shown to be highly effective in deactivating the chemical resulting in increased weed competition and reduced yields. This 'risk' needs to be considered and quantified.

   - Livestock farming and resource inefficiency – the call for a reduction in livestock (beef) production to reduce methane emissions is often supported by the associated concern that raising livestock is an inefficient use of plant proteins (it is estimated about 55% by weight of the UK's cereal production goes on animal feed[v]) and land. However, what is often ignored is that repurposing our grassland to grow human foods would be very difficult given the climate (rainfall), soil type, height above sea level and grade of land of much of our livestock production areas. Additionally, these areas are generally given over to Permanent Pasture which is proven to increase soil carbon content and store it. Whilst this is not a trade-off per se it is a necessary consideration when assessing the merits of policies to reduce agricultural emissions. In addition, feed wheat requires lower nitrogen inputs than milling wheat which must achieve 13% protein. It has been estimated that milling wheat requires a £30/t premium over feed wheat prices to allow for the extra nitrogen fertiliser costs[vi]. This means it also has a considerably higher GHG footprint, as at higher rates the efficiency of utilisation is diminished.

- Extensive versus intensive livestock farming – in terms of overall GHG emissions, extensive systems usually have a lower per area footprint than intensive concentrate- and grain-fed systems but a higher footprint in terms of emissions per kg of 'output'[vii]. This reflects the lower yield of grass-fed/extensive systems but as noted elsewhere in this response, such metrics do not acknowledge the wider biodiversity and environmental benefits of grassland nor that grasslands are the natural climax vegetation for many areas[viii] (see also point above). Such emissions are also less manageable than in intensive grain-fed beef systems where they are contained and could be 'managed'. As pigs and poultry that are most commonly reared in intensive systems do not produce enteric methane it is often suggested we should increase consumption of these meats at the expense of grass-fed beef. However, this does not account for the feed used in the intensive pig and poultry industry which is largely cereals and soyameal. The final point to note is that the environmental footprint of these different systems covers not only GHG but also water, land, and energy. For example, British grass-fed beef is arguably more climate friendly when compared with the Brazilian system due to the absence of land use change emissions[ix] and that grass-fed systems used the least amount of water[x].

- Rewetting peatlands – The emphasis on CO_2 in climate change mitigation has sidelined the more potent GHG methane. As a result;

    a. Agricultural peatlands – any move towards addressing GHG emissions in lowland productive peatlands should consider the trade-off between net zero and food production as the main paludicultural crops are not food producing; instead focussing on fibre and biomass. This is particularly important for vegetable production as most vegetable and salad crops are grown on lowland peat with c30% of our fresh vegetables grown on the peat and silt soils of the Fens[xi]. Water table depth management is an important aspect of restoring agricultural peatlands and there are moves to support paludiculture through policy. However Evans et al (2021)[xii] suggests that GHG emissions from agricultural peatlands could be reduced without impacting significantly on their productive use by halving the water table depth.

Consequently, we support the concept of 'dynamic' water level management and limiting the extent of summer water table drawdown as combining these measures with regenerative farming could reduce current emissions whilst retaining existing productive capacity, particularly of vegetables. 'Dynamic' water table management could also respond to different crop types as shallow rooted lettuces for example could tolerate higher water table conditions than deeper rooted potatoes[xiii].

b. Upland peatland restoration - decisions on reducing vegetation management through limiting opportunities for prescribed and controlled burning on heathlands and peatlands to reduce CO_2 emissions have overlooked the consequences this has on methane (and other SLCPs). Firstly, although not the subject of this inquiry, reduced vegetation management increases the risk of wildfire and the release of black carbon emissions (an SLCP). Secondly, the focus on rewetting peatland as a means of restoring peatland function and mitigating wildfire is overlooking the increase in methane emissions initially, largely due to the open water pools behind the ditch blocks[xiv], although this could be 'controlled' through managing water table depth (note: as mentioned above there are natural CH_4 emissions from peatlands due to their waterlogged status). Recent research over a 10-year period[xv] has suggested caution in "the wetter the better" approach to blanket bog GHG emissions with water table depth important in achieving a net C sink and a beneficial net GHG balance. Plant composition is also relevant as vascular plants can increase CH_4 production, suggesting that during the restoration (rewetting) phase the ability to manage vascular species to allow moss recovery is important[xvi]. Peatland GHG budgets need to reflect time periods as short-term evidence is not fully accounting for GHG fluxes with, for example, carbon and methane requiring 10-20 and 15+ years monitoring respectively[xvii].

Data, measurement, and monitoring

Our comment relates to all four questions posed.

It is vital that this element of the GHG inventory is appropriately addressed, particularly with regard to methane. As Professors Godfray and Allen (who has given evidence) of the Oxford Martin School recently said in a blog[xviii], what is needed is a way of assessing the relative benefits of policies to address the mitigation of carbon dioxide and methane emissions. The current focus on the CO_2e metric is, as is widely acknowledged, distorting the influence of SLCPs like methane as it does not relate emissions to climate change contribution. This has significant implications for policy direction in agriculture – and habitat conservation (see trade-offs above) – and in particular livestock farming as it is effectively overemphasising the contribution of the national herd by 3-4x; assuming the national herd size stays the same[xix].

Whilst the calls for a reduction in meat consumption are valid as the short-life of methane means that fewer livestock will result in a short-term cooling benefit, using different metrics to take account of the different impacts of the various GHGs such as GWP* for methane (although this could be expanded to other SLCPs) would provide a better basis for judging the impact of any policy decisions. Effectively this considers methane in terms of a CO_2 warming equivalent (CO_2-w.e.) in contrast to an emission equivalent (CO_2e) and ensures that the level of action to offset long-term sustained CH_4 emissions and the potential short-term benefits of reducing are correctly assessed and valued[xx]. A recent paper by McAuliffe et al[xxi] has demonstrated how the use of different emission factors and GWP metrics impact on the emissions calculated for a British pasture-based beef system and that for the first c20 years methane emissions are most relevant. Post that, the longer-lived nitrous oxide emissions become the dominant GHG. This paper also expressed the need for broader sustainability assessments to include human health, agricultural resilience and food security.

The important policy conclusion is that more than one metric needs to be used in order to fully understand the climate impact of food and the risk of poor decisions based on GWP100 alone.

We would also add that the source of methane is an important consideration in measuring and monitoring its impacts. As methane breaks down it releases CO_2. If this is from enteric methane (i.e., from a natural source) then this is not additional CO_2 as it is 'releasing' the CO_2 absorbed by the plants on which the livestock fed[xxii].

Agriculture

Q16:

We would like to highlight three possible solutions to minimising methane emissions from agricultural sources:

1. Zeolites

   These potentially have a role to play in indoor livestock systems (for example spread in walkways or used in the bedding) as when treated with a copper catalyst are effective at capturing methane[xxiii]. This type of catalyst is more energy efficient as the captured methane is oxidised at lower temperatures. However more research is needed to understand their deployment in indoor livestock systems.

2. Biochar

   Applications of biochar have been mooted as a possible way of enhancing carbon sequestration in agricultural soils, although this has not yet been proven. However, biochar could also reduce methane emissions from peatland (acidic) soils if paludiculture is adopted (i.e., flooding is part of the management regime)[xxiv]. Its precise application will be important as scientific evidence varies as to its contribution to mitigation and enhancing emissions with water management and soil pH important determinants of its effect on methane emissions.

3. Silvopastoral agro forestry.

   The GWCT has been involved in work that is showing that planting willow as part of a silvo-pastoral scheme for ruminants to feed on could result in reductions in methane (as well as ammonia, nitrous oxide and carbon dioxide, and providing important nutrients) due to the presence of condensed tannins increasing the flow of rumen-bypass protein and essential amino acids to the small intestine[xxv]. A co-benefit would be an increase in the supply of important nutrients for ruminant including some giving anthelmintic effects.

Q19:

When grazed by livestock legumes produce less enteric methane than grass and also benefit future crop production if part of a rotation through fixing nitrogen and reducing the need for inorganic N applications. This may require collaboration between farmers as arable farmers may not have the necessary welfare and housing requirements to support livestock to graze the legumes as a permanent part of the farming operation. Legumes such as clover can also support pollinators. However, in some climates and soil types increased nitrous oxide emissions are a potential trade-off.

Phosphate concentrations are a significant factor in freshwater methane emissions and affect water quality. Existing measures to address nutrient leaching through reduced cultivations, minimising compaction (tramlines), buffer strips and cover crops and improving phosphorus use efficiency will support both improved water quality, biodiversity and reduced CH_4 emissions. However, it should also be noted that domestic sources such as wastewater treatment plants dominate phosphorus concentrations at low flows.

Q20:

We have to a degree addressed this in answers to the sections on trade-offs and data, measurement and monitoring and would draw the Committee's attention to the McAuliffe paper in this regard with respect to economic and social sustainability. We would add that the environmental sustainability aspect needs to go beyond climate change and to consider broader environmental resilience. Management changes to address GHG emissions if they impact on vegetation composition and result in habitat changes could also impact upon broader biodiversity such as pollinators and natural pest predators thereby affecting our broader food security.

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[i] Abdalla, M. et al (2016), Emissions of methane from northern peatlands: A review of management impacts and implications for future management options. Ecology and Evolution, 6: 7080–7102. doi:10.1002/ece3.2469

[ii] Heinemeyer, A (2023) Restoration of heather dominated blanket bog vegetation for biodiversity, carbon storage, greenhouse gas emissions and water regulation: comparing burning to alternative mowing and uncut
management : Final 10-year Report to the Project Advisory Group of Peatland-ES-UK Research Report. University of York.

https://doi.org/10.15124/yao-2wtg-kb53

[iii] Abdalla, M. et al (2016), Emissions of methane from northern peatlands: A review of management impacts and implications for future management options. Ecology and Evolution, 6: 7080–7102. doi:10.1002/ece3.2469

[iv] Kookana Rai S. (2010) The role of biochar in modifying the environmental fate, bioavailability, and efficacy of pesticides in soils: a review. Australian Journal of Soil Research 48, 627-637. https://doi.org/10.1071/SR10007

[v] The Conversation, 5 July 2022. The UK urgently needs to cut its methane emissions by 2030:
cows and sheep hold the key to success. Ian Plewis Emeritus Professor of Social Statistics, Univ of Manchester.

[vi] What milling premium do growers need to cover extra N costs? - Farmers Weekly (fwi.co.uk)

[vii] Garnett, T (2010) Intensive versus extensive livestock systems and GHG emissions. FCRN briefing paper.

[viii] Garnett, T et al (2017) Grazed and Confused? Ruminating on cattle, grazing systems, methane, nitrous oxide, the soil carbon sequestration question – and what it all means for greenhouse gas emissions. FCRN, University of Oxford.

[ix] ibid

[x] Klopatek, S.C. et al (2022) Grass-fed vs. grain-fed beef systems: performance, economic, and environmental trade-offs, Journal of Animal Science, Volume 100, Issue 2, https://doi.org/10.1093/jas/skab374

[xi] Rhymes, J. et al. (2023) The future of UK vegetable production – Technical Report.
https://www.wwf.org.uk/our-reports/future-uk-vegetable-production-technical-report

[xii] Evans, C. D. et al.(2021) Overriding water table control on managed peatland greenhouse gas emissions. Nature
https://doi.org/10.1038/s41586-021-03523-1

[xiii] Rhymes, J. et al. (2023) The future of UK vegetable production – Technical Report.
https://www.wwf.org.uk/our-reports/future-uk-vegetable-production-technical-report

[xiv] Abdalla, M. et al (2016), Emissions of methane from northern peatlands: A review of management impacts and implications for future management options. Ecology and Evolution, 6: 7080–7102. doi:10.1002/ece3.2469

[xv] Heinemeyer, A (2023) Restoration of heather dominated blanket bog vegetation for biodiversity, carbon storage, greenhouse gas emissions and water regulation: comparing burning to alternative mowing and uncut
management : Final 10-year Report to the Project Advisory Group of Peatland-ES-UK Research Report. University of York.
https://doi.org/10.15124/yao-2wtg-kb53

[xvi] Abdalla, M. et al (2016), Emissions of methane from northern peatlands: A review of management impacts and implications for future management options. Ecology and Evolution, 6: 7080–7102. doi:10.1002/ece3.2469; How does peatland vegetation respond to prescribed burns? - Game and Wildlife Conservation Trust (gwct.org.uk)

[xvii] Heinemeyer, A (2023) Restoration of heather dominated blanket bog vegetation for biodiversity, carbon storage, greenhouse gas emissions and water regulation: comparing burning to alternative mowing and uncut
management : Final 10-year Report to the Project Advisory Group of Peatland-ES-UK Research Report. University of York.
https://doi.org/10.15124/yao-2wtg-kb53

[xviii] https://www.oxfordmartin.ox.ac.uk/blog/methane-meat-and-metrics/

[xix] ibid

[xx] John Lynch et al (2020) Demonstrating GWP*: a means of reporting warming-equivalent emissions that captures the contrasting impacts of short- and long-lived climate
pollutants Environ. Res. Lett. 15 044023 https://doi.org/10.1088/1748-9326/ab6d7e

[xxi] Graham A McAuliffe et al (2023) Are single global warming potential impact assessments adequate for carbon footprints of agri-food systems? Environ. Res. Lett. 18 084014 DOI 10.1088/1748-9326/ace204

[xxii] What is GWP*? | AHDB

[xxiii] Mundra, I and Lockley, A (2024) Emergent methane mitigation and removal approaches: a review. Atmospheric Environment X21 100223 https://doi.org/10.1016/j.aeaoa.2023.100223

[xxiv] Jeffery, S. et al (2016) Biochar effects on methane emissions from soils: A meta-analysis, Soil Biology and Biochemistry, Volume 101, Pages 251-258, https://doi.org/10.1016/j.soilbio.2016.07.021

[xxv] Kendall, N.R. et al (2021) Trace element composition of tree fodder and potential nutritional use for livestock, Livestock Science, Volume 250, ISSN 1871-1413, https://doi.org/10.1016/j.livsci.2021.104560