Game & Wildlife Conservation Trust submission to the

Dasgupta Review on the Economics of Biodiversity - Call for Evidence

The Game & Wildlife Conservation Trust (GWCT) is a leading UK charity conducting conservation science to enhance the British countryside for public benefit. For over 80 years we have been researching and developing game and wildlife management techniques. The Allerton Project, the Trust's demonstration farm, researches the effects of different farming methods on wildlife and the environment. We use our research to provide training and advice on how best to improve the biodiversity of the countryside. We promote our work to conservationists, including farmers and landowners, and offer an on-site advisory service on all aspects of game and wildlife management, so that Britain's countryside and its wildlife are enhanced for the public benefit.www.gwct.org.uk

Part 1: Biodiversity and Ecosystem Service Science and Evidence

Question 1 (Biodiversity and Ecosystem Service Science): IPBES assessments and GEO6 will form an important part of the Review's assessment of the state of biodiversity, the biosphere and its ability to deliver ecosystem services. What further evidence should the Review consider in this area? What does the scientific evidence on global biodiversity and ecosystem condition decline suggest about the Earth's ability to continue providing services essential to human prosperity over different time periods?

ANSWER:

- ***Evaluating farming systems*** - we support the assertion that "Given that a multi-dimensional understanding of the environmental effects of alternative production systems is integral to delivering sustainable intensification, more field measurements linking yield with a broader suite of externalities across a much wider range of practices and sectors are urgently needed."[1] The costs and benefits of different farming systems need to be expressed as units of production in order to compare effectively.
- ***Multi-functional approach needed*** - we are concerned that undue emphasis on GHG and climate change will reduce the focus on biodiversity as an ecosystem service. The definition of biodiversity is therefore important as often biodiversity in the form of wildlife/species diversity is seen as a cultural ecosystem service linked with conservation and recreation rather than its functional value to provisioning, supporting and regulating services. Managing for one ecosystem service may leave species and their contribution to a broader suite of services unprotected e.g. prohibiting heather burning - see Q12.
- ***Spatial scale*** - the importance of spatial scale in measuring ecosystem services must be acknowledged.

[1] Balmford et al 2018 The environmental costs and benefits of high-yield farming, Nature Sustainability September 2018. https://doi.org/10.1038/s41893-018-0138-5

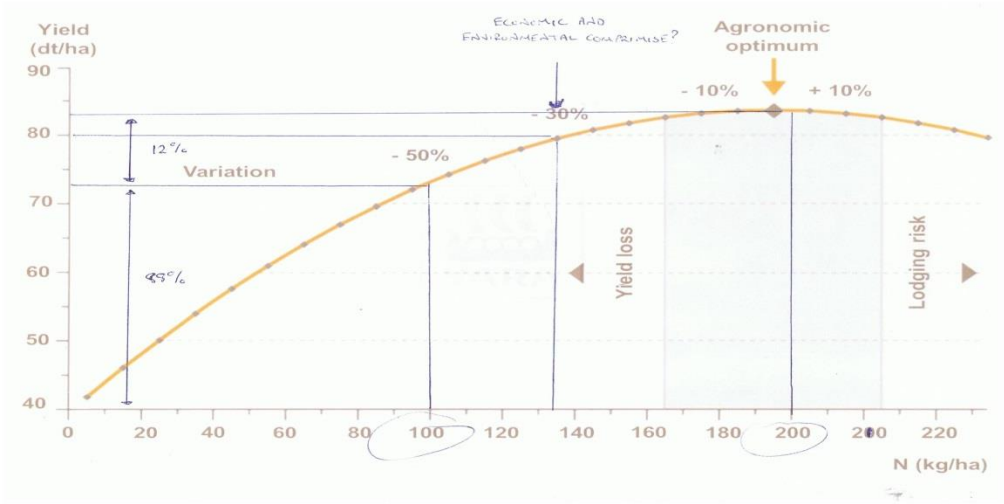
- ***Monitoring metrics*** **-** we are concerned that the complexity of biodiversity "networks", the impact of changing climatic conditions, the impact of time and gaps in knowledge may result in managers not knowing which species are critical for an ecosystem service. "If managers do not know which species are critical for an ecosystem service, then each species that is functionally lost increases the risk that an ecosystem service will be lost or reduced."[2]

Question 2 (Limits): What is the best available evidence on the regenerative rates and carrying capacity of ecosystems e.g. fisheries? What is the best evidence on, and most compelling examples of, maximum sustainable yields, and where ecosystem thresholds and tipping points have been shown to affect sustainable economic growth?

ANSWER:

- ***Impact of retail prices*** - the decline in the cost of food has led to a decline in agricultural incomes. This has caused many farmers to intensify output and to specialise. Traditionally cropping rotations consisted of phases where crops were grown which replenished the soil's health and fertility. Modern crop sequences are largely exploitative with manufactured inputs such as fertilisers and other inputs sustaining cropping. This has led to a decline in soil health and is starting to limit crop output.
- ***Soil health*** - soil health is limiting yields as poor structure impacts on a crop's ability to absorb nutrients. Crop yield is greatly influenced by the availability of Nitrogen. However, as the Nitrogen response curve shows (see overleaf) 50% of the optimum supply contributes a mere 10% and this is clearly a high impact for a low return. In all-arable rotations, a common feature of intensification, soil heath can be rapidly restored by the inclusion of a restorative grass/legume rest period. This does not need to be grazed by livestock; the green matter can simply be cut and composted within the field, feeding and restoring the soil. This is important as livestock farming is implicated in contributing to GHG emissions and dietary choices are changing meaning that consumption and therefore demand are likely to fall. A ley period of between three and four years is optimal although in some circumstances two might be adequate. This regenerates soil health through the accumulation of nutrients and addition of carbon-rich organic matter. We firmly believe that the new Environmental Land Management Scheme (ELMS) should part-fund this approach for the public good it provides. See also Q20.

[2] Dee et al 2017. To what extent can ecosystem services motivate protecting biodiversity. Ecology Letters (2017) 20: 935–946



Part 2: Biodiversity and Economic Prosperity

Question 3 (Biodiversity and Economic Prosperity – Conceptual Framework): Biodiversity supports the provision of many ecosystem services, which are important for economic prosperity and growth. Economic growth also affects the demand for, and supply of, the Earth's resources. What conceptual frameworks and typologies clearly describe the relationship between biodiversity, ecosystem productivity and resilience, ecosystem services, economic prosperity and economic growth? Where have these frameworks been applied to reveal critical relationships? What are the most critical aspects of these relationships for the Dasgupta Review?

ANSWER: We do not have expertise sufficient to comment on this matter.

Question 4 (Biodiversity and the SDGs): What are the links between biodiversity and economic prosperity that are most critical to synergies and trade-offs across the SDGs? How should sustainable economic growth be defined and measured given the evidence of how the SDGs and economic prosperity are affected by biodiversity loss? The review is interested in relevant links with biodiversity and economic growth across all the SDGs, particularly climate mitigation and adaptation, poverty reduction, food production, human health and wellbeing, consumption and production, and gender and broader inequalities.

ANSWER:

- ***Food production*** – the Voluntary National Review identified poverty and food security as two areas for improvement. Balancing the objectives of food production and biodiversity is key to this. As we discuss in Q7 below opting for an organic approach to food production in response to demands for more 'environmentally-friendly' farming systems will not address this balance as yields are up to 40% lower across the rotation. Sustainable Intensification systems which focus on maximising yields on the most productive land and 'farming' for wildlife and other related ecosystem services on marginal land should be pursued as a means of meeting SDGs. See also Q10.
- ***Sustainable moorland management*** - the uplands deliver a range of provisioning, supporting, regulating and cultural ecosystem services. The multi-functional nature of moorland must be understood when addressing policy objectives such as climate change

and net zero. Existing land management systems that are proven to support multiple objectives, such as sustainable grouse moor management, can protect this vital ecosystem from other damaging economic activities such as commercial forestry, wildfire (which is exacerbated by the absence of vegetation management such as rotational heather burning– see Q12) and contribute to improving biodiversity and economic resilience. As Dee *et al* (2017) stated "…uncertainty surrounding how biodiversity produces services makes it optimal to protect more species than are presumed critical." We believe grouse moor managers play their part in contributing to the delivery of Sustainable Development Goals 13 (climate), 15 (life on land) as well as supporting SDG 8 (livelihoods).

Question 5 (Impacts of Biodiversity Loss on Sustainable Economic Growth): What is the best evidence on the sustainability of current global economic growth, based on current rates of biodiversity loss? How much (if any) biodiversity loss needs to be stopped and/or reversed to achieve sustainable economic growth? Please reference any evidence or analysis that underpins your answers.

ANSWER: We do not have sufficient expertise to comment on this matter

Question 6 (Benefits of Tackling Biodiversity Loss and Costs of Inaction): What is the best evidence on the economic benefits of biodiversity? What evidence exists on who benefits from biodiversity? What positive business cases (win-wins) exist for tackling biodiversity loss e.g. impacts on jobs, productivity, income, human health outcomes? Conversely, what is the best evidence on the costs of current trajectories of biodiversity loss? What evidence is there of the distribution of these costs within and between countries?

ANSWER:

- ***Predator management*** - GWCT research has shown that predators caused 43% of ground-nesting bird nests to be lost[3,4] and that brown hare numbers increased dramatically where predators were controlled[5]. On moorland 4.1 pairs of curlew, 9.7 pairs of golden plover and 19.5 pairs of lapwing were recorded for each £10,000 spent on predator control, relative to the uncontrolled area[6]. This demonstrates the return on investment for threatened species of predation control.
- ***Game shooting*** - shooting is worth £2 billion to the UK economy (GVA) and supports 74,000 FTE jobs[7]. Two-thirds of the rural land area, comprising 2 million hectares, is actively managed for shooting and conservation with £250 million p.a. spent on conservation alone[7]. Grouse moor owners in England spend £52.5 million annually on moorland management, with associated businesses benefiting by £15.2 million p.a.[8], an important contribution to sustaining remote rural communities and supporting education, health and other services[9]. At the Allerton Project the GWCT has shown that by managing habitat, controlling predators and providing food in winter, wild pheasant numbers increased along with songbirds, moth

[3] https://www.gwct.org.uk/game/research/predation-control/
[4] https://www.gwct.org.uk/allerton/research/boosting-biodiversity/
[5] https://www.gwct.org.uk/research/species/mammals/brown-hare/gamekeeping-and-brown-hare-numbers/
[6] Unpublished GWCT research using data from Fletcher et al (2010) Changes in breeding success and abundance of ground-nesting moorland birds in relation to the experimental deployment of legal predator control JApplEcol 2010, 47, 263–272
[7] The Value of Shooting, PACEC 2014.
[8] Countryside Alliance & The National Gamekeepers Organisation (2015).
[9] Fraser of Allander Report (2010). An Economic Study of Grouse Moors. University of Strathclyde, Glasgow.

species and brown hares. The £50k annual spend on conservation was paid for by game hunters with no contribution from the public purse.

- ***Pollination services*** - the contribution that pollinating insects make to crop production is well documented. In the past these "pollination services" were largely provided by indigenous species inhabiting the landscape. They have a value to the UK alone in the region of £690 million pa[10]. As landscapes have become more simplified through agriculture, concern is rising that crop yields might be affected through poor pollination. Work at the Allerton Project showed that where flowers in hedgerows were covered to prevent insects pollinating them, fruit and berry production declined along with the number of birds visiting the hedge to feed in winter time. This shows that it is not just our own food supply that is dependent upon pollinating insects. Insects also form a vital part of other food webs, most particularly as a source of food themselves to the chicks of most farmland bird species. GWCT research shows a direct correlation between grey partridge chick survival and the density of insects in summer cereal crops (see also Q9).

Question 7 (Cost and Risks of Action): What evidence exists of 'transition risks' from moving to actions needed to protect, restore and enhance biodiversity? What is the best evidence on the costs of these actions? What evidence suggests who will be most affected by these costs and risks?

ANSWER:

- ***Land sparing*** – the IPBES assessment stated that "Although protected areas have expanded in the region, protected areas alone cannot prevent biodiversity loss." This highlights the importance of engaging with the land management community and the importance of "more, bigger, better and joined" parcels of land managed for biodiversity (Lawton Review) (see Q15). We argue for a farm/field level approach to land sparing, rather than land sharing which has the potential to reduce food production levels (provisioning), as a means to address agricultural economic sustainability and biodiversity simultaneously. Focussing intensive production in the field centre whilst taking the least productive/marginal 10-13% out of production and managed for "biodiversity and ecosystem provision" would improve crop yields per ha whilst also improving farmland biodiversity (as proven at the Allerton project www.gwct.org.uk/allerton).
- ***Agricultural sustainability*** – limiting synthetic fertilizer and pesticides and promoting organic agriculture is often espoused as a viable solution to address the interdependent goals of increasing or at least maintaining yield while protecting the environment, conserving natural resources, and slowing climate change[11]. But whilst organic agriculture may be a market-led decision by farmers or food companies to achieve greater profit for their products, the estimated 40% reduction in yields across the rotation means that such an approach would come with significant trade-offs (including increased GHG emissions[12]). Forty percent of the global population relies on the application of Nitrogen to feed them through the ability to sustain higher yields. It also means that areas of land elsewhere on the planet which support high levels of biodiversity, particularly areas of natural or semi-

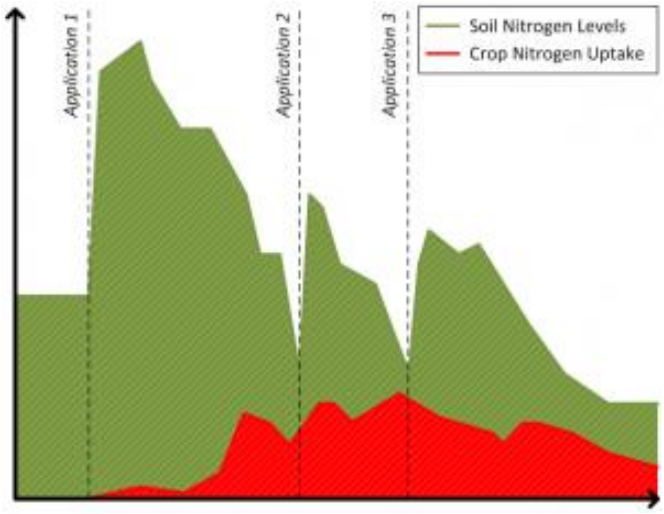
[10] http://www.reading.ac.uk/web/files/food-security/CFS_Case_Studies_-Sustainable_Pollination_Services.pdf
[11] Gaffney et al 2019 Science-based intensive agriculture: Sustainability, food security, and the role of technology Global Food Security 23 (2019) 236–244
[12] Smith et al 2019 The greenhouse gas impacts of converting food production in England and Wales to organic methods NATURE COMMUNICATIONS | (2019) 10:4641 | https://doi.org/10.1038/s41467-019-12622-7 | www.nature.com/naturecommunications

natural habitat, are not put under pressure by a need to increase food production to make up for de-intensification elsewhere[13]. Intensive agricultural production systems can improve their environmental footprint through the use of improved agronomy, genetics, technology and precision farming techniques. Government intervention through ELM and other capital investment programmes will be required to encourage national adoption rather than relying purely on market forces.

Question 8 (Opportunities from Tackling Biodiversity Loss): How can new technology assist with restoring biodiversity, while simultaneously delivering economic prosperity? e.g. artificial intelligence, biotechnology. What economic opportunities exist from protecting, restoring and enhancing biodiversity? e.g. learning from nature (biomimicry), biopharma, among others.

ANSWER:

- ***Nitrogen application sensors*** – the application of Nitrogen fertiliser makes it possible to grow crops on soils which are often poorly structured and enables farmers to adopt unsustainable rotations. This affects biodiversity in three ways: the build-up of diseases and weeds associated with a single or limited crop rotation requiring increased applications of pesticides which in turn impacts on non-target species growing or living within the crop; a single commercial crop by implication has reduced biodiversity, this being particularly the case where "block cropping" is practised resulting in a landscape scale monoculture[14]; and, Nitrogen lost to water can have a seriously negative impact on aquatic biodiversity. In addition to the adoption of more sustainable farming systems (which incorporate balanced rotations – see Q2) reducing Nitrogen leakage from the system could be improved by technology such as real-time N sensors which measure how much nitrate is in the soil so that the Nitrogen application is only ever as much as is needed by the crop. The chart below shows the Nitrogen that is not used by the plants. This could be reduced by measuring or predicting Nitrogen requirements.

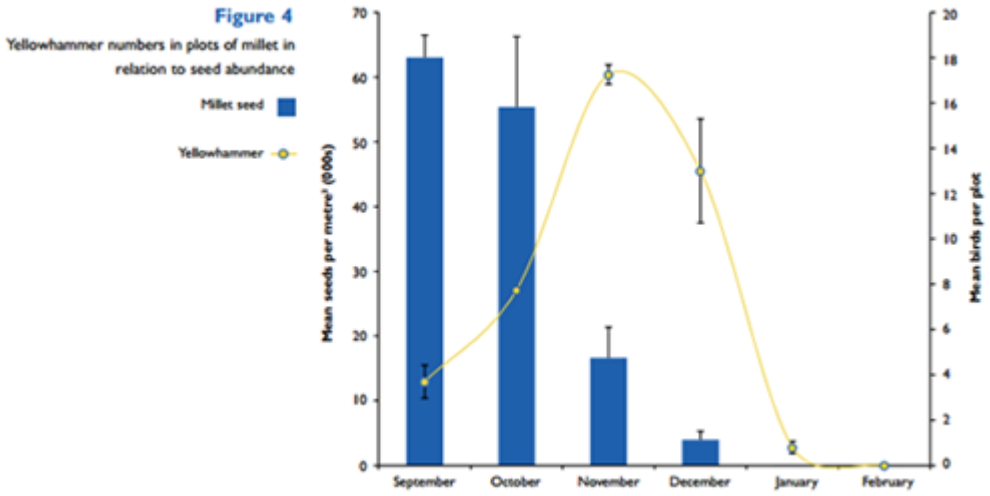


Source: Cambridge Consultants

[13] Green at al 2019 Land sparing to make space for species dependent on natural habitats and high nature value farmland · Proceedings of the Royal Society B: Biological Sciences 286(1909):20191483DOI: 10.1098/rspb.2019.1483

[14] https://www.gwct.org.uk/farming/research/the-importance-of-different-crops-for-supporting-bird-life/

- ***Specialist wildlife plant breeding*** – this is likely to require intervention funding as the market place is limited but the development of crops that hold onto their seeds throughout the "hungry gap" would significantly improve their value to wildlife. Many of the plants currently used in wildlife mixtures have been bred as combinable food crops for mankind and have been genetically selected over time to shed their seed easily. The graph below shows how millet seed abundance reduces at the key "hungry gap" period and affects yellowhammer numbers (GWCT research[15]).



- ***Camera traps and nest sensors*** – recent work by the GWCT using remote cameras to monitor ground nesting species nesting success has identified badgers as a major cause of nest predation. Badgers are entirely protected by law and their populations have increased substantially as a result (see also Q12). The use of such technology can therefore help determine reasons for biodiversity loss. Likewise, dummy eggs containing thermometers and transmitters enable researches to remotely record when a nest is predated or abandoned. With greater understanding of predator/prey interactions techniques can be devised to target regulation measures.

Question 9 (Economic and Finance Decision Makers): Which sectors of the economy rely most on biodiversity and ecosystem services? How are they affected by biodiversity decline? Please provide strong case and/or sectoral examples and evidence on how changes in biodiversity (loss or gain) has affected, or been affected by, economic and finance decision-making.

ANSWER:

- ***Wild game shooting*** - lowland wild game production has decreased reflecting reduced insect numbers (e.g. young grey partridge chicks need c2000 insects per day in the first two to three weeks of life), reduced habitat (both in terms of quality, connectivity and variety i.e. food, nesting, cover) and increased predation[16]. For example, in 1911 we estimate from bag data that there must have been more than a million pairs of grey partridges breeding in Britain. After the Second World War, the numbers of grey partridges dropped by 80% in 40 years.

[15] https://www.gwct.org.uk/blogs/allerton-project-research-blog/2016/november/boosting-biodiversity-feeding-birds-in-the-%E2%80%98hungry-gap%E2%80%99/
[16] https://www.gwct.org.uk/game/research/species/grey-partridge/

- ***Driven grouse shooting*** – the red grouse is a bird of heather moorland and as a consequence grouse shooting has been instrumental in retaining heather moorland and peatlands in the face of challenges from other economic activities such as farming and forestry. Heather is a globally important habitat - 75% of the world's heather habitat is found in Britain – and it is rarer than rainforest. Grouse shooting has been one of the major land uses of upland ground and an important source of income for many land owners. The GWCT estimated that the numbers of grouse shot per year between 1911 and 1980 had fallen by 82% with numbers stabilising on many English moors since[17]. The causes of red grouse declines appear to be multifactorial. On a national basis, there was a 30% loss of heather between 1950 and 1980, but while this is important, it cannot account for the full extent of the decline in grouse stocks. There is evidence that predation pressure, both by mammals and other predatory birds, has increased on many moors, and the diversity of habitat produced by rotational, prescribed heather burning is important in providing nesting cover and insect life. Ours and others' research demonstrates that some of the practices that underpin grouse moor management are important in supporting the species upon which international biodiversity designations rely.

Part 3: Causes of Biodiversity Loss

Question 10 (Market and Institutional Failures): What are the main market and institutional failures affecting biodiversity? What is the best evidence (including case examples) that illustrate these failures?

ANSWER:

- ***Cheap food*** – the drive to reduce food prices has resulted in a focus on reducing the costs of production whilst increasing yields with consequent impacts on the environment (both in the UK and globally). The proportion of household income spent on food has more than halved over the past 60 years, according to the Office for National Statistics, and spend on food at home now represents only 8% of total household expenditure. Eurostat data shows that UK food costs 8% less than the EU average. De-valuing food has also led to significant increases in waste. WRAP has estimated that annual food waste within the UK is around 10 million tonnes with a value of over £17 billion a year, and is associated with around 20 million tonnes of greenhouse gas (GHG) emissions. The data showed that the amount of food wasted post-farm-gate in the UK is equivalent to around a quarter of that purchased. The land used to produce this un-used food could be removed from production to deliver other environmental benefits for example pollen and nectar mixes to feed insects, wildlife seed mixes to feed birds in winter or put aside for soil restoring measures.

Question 11 (Economic Sectors): Which economic sectors have the biggest impact on biodiversity loss? Which economic sectors are most affected by biodiversity loss? Please reference evidence and analysis (including case examples) that underpin and illustrate your answers.

[17] https://www.gwct.org.uk/research/species/birds/red-grouse/

ANSWER:

- ***Farming*** – GWCT research has demonstrated that the intensification of farming and increased use of pesticides and fertilisers has had a significant effect on biodiversity[18]. However ironically this reduced biodiversity has also cost the farming industry through the degradation of soil health and impacts on pollination services (see also Q6 and Q20). The creation of landscape monocultures is particularly damaging and future Environmental Land Management Schemes will need to reward farmers from the public purse for delivery of environmental goods and services. Prescriptions and "red tape" need to be avoided to encourage maximum uptake at a landscape scale. An over-all extensification of the production system needs to be avoided on the grounds of the need for a base level of indigenous food production to be maintained and to protect sensitive global habitats from reversion to agriculture driven by a need to make up significant production reductions (see Q7). Research has clearly shown that intensive agriculture is extremely important in protecting natural habitats[19].

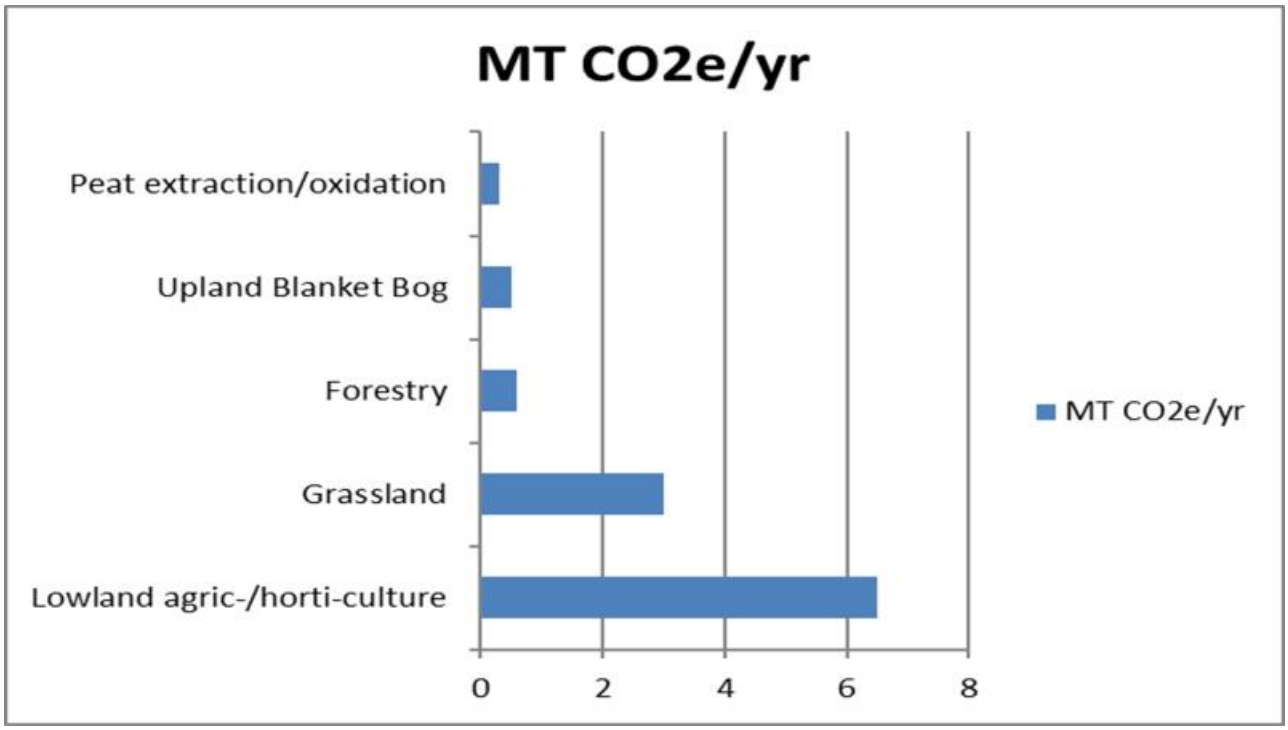
Question 12 (Time): What evidence exists to suggest that balancing short and long timescales is a challenge for decision-making affecting biodiversity? Please provide evidence (including case examples) where short-term decisions have harmed biodiversity. How does this vary for different ecosystems and/or sectors? What should be the approach to discounting for actions that affect biodiversity?

ANSWER:

- ***Conservation v protection*** - for over a generation the UK's approach to biodiversity conservation has been based on protection and prescription. A species in worrying decline is typically given legal protection e.g. badgers under the Badgers Act. But protection is a clumsy tool. Populations of some protected species are no longer under-threat; in the case of the badger its population levels are now impacting on other more threatened species such as ground-nesting birds, bees and hedgehogs (see Q8). Change to the legislation is needed so that it allows for greater flexibility to manage species with protection commensurate with population status. This is the key conclusion of the Law Commission's Review of Wildlife Law in the UK[20].
- ***Heather burning*** - evidence shows that burning on upland peatland produces very low emissions (when compared with lowland agricultural peatlands) - see chart overleaf. The benefits of prescribed burning to the prevention of high/uncontrolled emissions from wildfire and to threatened upland wading bird populations are being overlooked. The dramatic wildfire on Saddleworth Moor in 2018 in which all surface vegetation was incinerated and 200 years of peat sequestering carbon burnt demonstrates the folly of management failure. Better understanding of how land management, such as that practised by grouse moor owners, contribute to the delivery of ecosystem services is required.

[18] The GWCT's Sussex study area (https://www.gwct.org.uk/research/long-term-monitoring/sussex-study/) has collated over 40 years of data that allows us to investigate how invertebrate abundance changed in relation to changes in farming and climate.
[19] Green at al 2019 Land sparing to make space for species dependent on natural habitats and high nature value farmland · Proceedings of the Royal Society B: Biological Sciences 286(1909):20191483DOI: 10.1098/rspb.2019.1483
[20] The Law Commission (LAW COM No 362) WILDLIFE LAW VOLUME 1: REPORT. November 2015. http://www.lawcom.gov.uk.

Instead of banning management practices such as prescribed burning, research should be undertaken on learning how to use these techniques better.



Source: BEIS

- ***Pesticides*** **-** whilst the overall effect of pesticide use has been mainly negative, there are situations where pesticides aid biodiversity. GWCT research has shown that kale provides an excellent food source (as well as cover against predators and weather) for a range of farmland birds, yet it is a crop which is difficult to grow due to flea beetle attack. Some farmers have ceased to grow kale, some continue to try but with poor results, and some use sequential pyrethroid sprays which can be ineffective but kill other non-target insects inhabiting the crop. The availability of neonicotinoids in such situations is important and as it is used as a seed dressing at sowing on plants that flower in their second year (such as Kale) poses no risk to pollinators as the chemical becomes inactive over the 12 month period before flowering. Asulam is an important tool in protecting against the spread of bracken on heather moorland. Whilst other herbicides can control bracken, Asulam is a selective herbicide, unlike the other alternative glyphosate, so has no impact on other moorland flora, particularly heather. Its retention as a tool for supporting upland biodiversity is therefore vital.

Question 13 (Business): What is the best evidence on the role the private sector (including the financial sector) plays in driving biodiversity loss and the direct and indirect impacts it has on biodiversity loss? What evidence shows the effect of biodiversity on firms' and investors' risks and/or returns in the short, medium and long term?

ANSWER:

- ***Supplier/farmer collaboration*** - the demand from the food chain for ever lower cost ingredients has driven agricultural intensification which in-turn has impacted upon

biodiversity. However, some companies are recognising the wider role they can play in enhancing the environment from where their ingredients are sourced. We work on two unique and distinct approaches developed by global brands Kellogg's and Nestle.

- ***Kellogg's*** has established a Producer Group and engaged independent experts to operate this on their behalf. The experts provide knowledge and advice through farm visits and reports, through to study tour tips, farm visits and seminars. Kellogg's do not pay a premium for the wheat they buy, but club membership and benefits are provided at no cost to the farmer participants. The objective is to raise business and environmental performance concurrently, with a special focus on farmland biodiversity.
- ***The Nestle approach*** works quite differently. Using a bespoke web-platform the farmer members up-load details of the environmental measures they have carried out on their farms. In most instances this is habitat creation or maintenance for the benefit of biodiversity. Each measure is automatically given a points value and when this exceeds 3,000 it automatically triggers a premium payment of 0.005 pence per litre on the milk supplied. For an average farmer with 200 cows producing 10,000 litres per cow per year this is worth £10,000 p.a. There is no formal inspection process, farmers simply up-load pictures of their tree or hedge planting schemes onto the platform where they can be viewed by their customer.

Part 4: Actions to Tackle Biodiversity Loss and Support Economic Prosperity

Question 14 (Valuation and Accounting): Please provide evidence (including case examples) where marginal valuation, natural capital assessments and accounts are helping policy-makers and the private sector to improve decision making in ways that enhance biodiversity and deliver economic prosperity. What evidence exists on the factors that are most critical for this type of information to improve decision-making?

ANSWER: We do not have sufficient expertise to comment on this matter

Question 15 (Behaviour): What are the critical factors affecting people's behaviours that affect biodiversity? What affects the speed and scale of this behaviour change? What evidence exists for individual preferences versus social or 'socially-embedded' preferences (to conform or compete with others)? Please provide the strongest examples where policy makers and the private sector have effectively incentivised behaviour change to reduce biodiversity loss.

ANSWER:

- ***Farmer clusters***[21] – farms and farmers typically work in isolation within a landscape, each business operating autonomously. Yet wildlife does not recognise farm boundaries, and this was very much the thrust of the Review carried out by Sir John Lawton – "Making Space for Nature" in which he identified that land management for biodiversity needed to be "more, bigger, better and joined". In 2012, in response to the Nature Improvement Area competition the Game & Wildlife Conservation Trust, began to bring small groups of farmers together to create so-called "farmer clusters". The precept behind the approach was very simple but had never been thought of before. Farmers and landowners were asked "What

[21] https://www.farmerclusters.com/

wildlife would you like to see on your farm?" Farmers then prioritised those species, with expert advice, and began collective measures on a landscape scale to foster habitat and management conducive to species increases. Many of the farmer clusters have grown to include non-farmers e.g. local residents have got involved in monitoring everything from barn owls to bats to harvest mice. This creates a spirit of collective ownership and responsibility as well as fostering better understanding of the management of food production alongside wildlife management. Since the first inception of Farmer Clusters a further 120 have formed across England. Natural England have recognised the value that this approach offers and have established a "facilitation fund" to enable potential cluster members to appoint a co-ordinator of their choice.

- ***"Conservation through wise use"*** – a blend of public and private finance is needed to support biodiversity. However land managers need to feel motivated and engaged as evidenced by the farmer cluster concept above. The focus needs to be on conservation using adaptive management (i.e. sustainable farming techniques and game management) not preservation (as pursued on nature reserves).

Question 16 (Fiscal Policy and Regulation): What are strong examples of fiscal and regulatory policy instruments that have simultaneously enhanced biodiversity and supported economic prosperity? What is the best evidence on the impact and effectiveness of these actions? The review is interested in examples at all scales, including regulation, planning, taxation and government spending, including subsidies.

ANSWER: We do not have sufficient expertise to comment on this matter

Question 17 (Trade, Aid, International Finance and Climate): What measures can be taken to bridge across geographic boundaries when biodiversity loss in one location is driven by action or consumption elsewhere? What evidence exists on how international trade policy, aid policy, and international financial transfers can tackle biodiversity loss? What are the potential win-wins in also tackling climate mitigation and adaptation with such policies and transfers?

ANSWER: We do not have sufficient expertise to comment on this matter

Question 18 (Private Sector and Finance): What are the most effective actions that the private sector generally, and finance sector specifically, can take and have taken that both enhance biodiversity and deliver economic prosperity? What actions should government take to enable the private sector and finance to take these actions? What evidence exists on the impact on biodiversity loss and economic prosperity of rules on financial disclosure, standards and certification schemes, and policies affecting investment decisions?

ANSWER:

- ***Tax incentives*** - we have already given the examples of Kellogg's and Nestle as to how the private sector can contribute to biodiversity. We believe that if private companies establish such initiatives and invest in improving biodiversity then there should be opportunities for these costs to be set against corporation tax. We believe that locally funded and operated approaches involving the food chain and private sector will be more focussed and effective than grandiose national schemes

Question 19 (Technology): What technologies are proving effective for ecosystem restoration and management while also supporting economic prosperity? What is the role for technological change in the short, medium and long-term to improve consumption and production efficiency? Note the review is interested in technologies across a broad range of sectors that have implications for biodiversity e.g. food production technologies.

ANSWER: We do not have sufficient expertise to comment on this matter

Question 20 (Other Comments): Please provide any other comments or evidence you think the Dasgupta Review should consider in its advice on how simultaneously to enhance biodiversity and achieve economic prosperity. The review welcomes evidence on where economic and financial decision makers in both the public and private sector can have the greatest impact.

ANSWER:

- ***Soil biota*** - we are concerned that elements which make up the collective of biodiversity which are lower profile, risk being neglected. We know that our higher species are completely dependent on the lower species which make up the food web. We know very little about the sub-terranean diversity of soil dwelling biota which are an all-important component of the health of our soil. These organisms, through a variety of processes, recycle organic materials releasing nutrients and providing food for higher organisms.
- ***Soil health*** - that soil is so economically neglected is a cause for great concern since 95% of our food production is dependent upon soil. Whilst the Government refers to "improving soil health" in the 25 Year Environment Plan no measures have been brought forward to support this. The pledge to identify the metrics which might be used to define a healthy soil will do nothing to facilitate actions that lead to improved soil health. Indeed, there are suggestions from Government that soil should be classified as a "private asset" rather than a public good which leads us directly back to the identical policy of the last 70 years which has led to the loss of soil and its condition. We suggest that a blended model is more appropriate where the landowner and society collectively invest in soil health since both derive benefit of different types. The yield plateau being experienced in most cropping systems is limiting our ability to meet increased domestic demand and this increases our food insecurity and ultimately will lead to the increased cost of food. Soils which are highly biologically active, inhabited by a wide range of species, are more productive and resilient in the face of climate change and therefore have the capacity to produce more food at lower environmental impact and cost.
- ***Conservation model*** – As stated above the UK's approach to biodiversity conservation has been based on protection and prescription which has largely failed to arrest a continuing decline in biodiversity e.g. the Farmland Bird Index has dropped by more than 50% since 1970. Updating the nation's approach to conservation could transform the prospects for many declining species as well as meeting sustainable development and ecosystem service ambitions. In our answers we have given examples of land management practices and farming systems which could deliver such goals.

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