

# Written evidence submitted by The Nitrogen Collaboration (SH105)

## EFRA Committee Call for Evidence on Soil Health

The Nitrogen Collaboration

### Summary

1. The impact that nitrogen has on soil health is often understated or misunderstood. There is evidence to show that excess synthetic nitrogen inputs negatively affects soil microbial populations causing a trophic cascade which alters the properties and organic content of the soil. As a result, soil is less effective at retaining water, sequestering carbon, and withstanding erosion.
2. In order to improve soil health, the Government requires metrics and data to measure progress towards sustainable soils. This includes taking stock of exactly how much nitrogen is being applied to the soil on each farm and how efficiently it is being used. This can be achieved by establishing a nitrogen balance sheet to account for the stocks and flows of nitrogen across the country, fed into by data from farm-level nutrient management plans and nitrogen budgets.
3. Nutrient management plans are a regulatory requirement for each farm under the Farming Rules for Water; however, enforcement of the rules does not accurately match the regulation. If land managers are required to hold records of nutrient management plans, Government should require these to be entered into a database so the information can be used in policies.
4. Most regulation around nitrogen is transposed from EU law and aimed at protecting water quality. Yet this does not go far enough to reduce excess nitrogen lost to the environment in all forms. The nitrogen cycle is a system and must be approached as such, with new primary legislation to hold departments accountable to nitrogen reductions in line with the Global Biodiversity Framework Target 7. The balance sheet and budgets would fall within this legislation.
5. Government should use the opportunity of the ELM standards to properly support farmers using agroecological practices which improve soil health. Current payments do not incentivise such practices, so many farmers are moving to intensive livestock production which has drastic impacts on soil health, as well as air and water quality, biodiversity and climate.

### Introduction

6. The Nitrogen Collaboration is a group of NGOs and scientists with a wide focus covering health, environment, climate and biodiversity. Initially founded by the Soil Association, Plantlife and WWF in 2021, we are looking to communicate and cooperate with the

Government to reduce the multitude of damaging impacts resulting from excessive nitrogen use in the UK and through the UK's global footprint.

7. The Collaboration is using various pathways to call on the Government to implement an integrated systems approach across the many policy areas that are impacted by excess nitrogen. Since the Environment Audit Committee's Eleventh Report: 'UK Progress on Reducing Nitrogen Pollution in 2018', Government has done very little to progress on nitrogen reductions.<sup>1</sup> Our aim is to encourage Government to increase nitrogen use efficiency and farmer profitability, and achieve drastic reductions in nitrogen use and waste as set out in Government targets, while eliminating the gulf between national and international commitments.
8. Nitrogen, whether inorganic or organic, impacts soil health and fertility. Good soil fertility was previously the primary focus of farming; the basis of crop productivity and a foundation for good agricultural practices. Farmers worked with nature, and what is now termed ecosystems services, to increase yields within the natural ability of the soil. Following the Second World War, farmers were encouraged to pursue higher yields using synthetic inputs without an understanding of the impact this had on soil health. As a result, the nitrogen cycle has been significantly altered through the addition of synthetic reactive nitrogen fertiliser to crops.
9. An excess of synthetic nitrates in the soil decreases soil pH, soil organic matter and biodiversity of soil microbial community structures.<sup>2</sup> For example, fertilisation using synthetic reactive nitrogen can reduce the allocation of organic carbon from the vegetation to mycorrhizal fungi, because the increasing supply of synthetic nitrogen reduces the plant's dependence on mycorrhizae for scavenging nitrogen from the soil.<sup>3</sup> Additionally, soil fauna react to increases in synthetic nitrogen through changes in the microbial community, which in turn alters the physical properties of the soil, including decreases in soil aggregation, water retention and infiltration, and organic matter turnover.<sup>4</sup>

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<sup>1</sup> Environment Audit Committee, 2018. UK Progress on Reducing Nitrate Pollution, Eleventh Report of Session 2017-19, House of Commons.

<sup>2</sup> Zhao, Z-B, He JI, Quan Z, Wu, C, Sheng, R, Zhang LM, Geisen, S. 2020. Fertilization changes soil microbiome functioning, especially phagotrophic protists, *Soil Biology and Biochemistry*, 148, pp. 107863; Fauci, MF and Dick, RP, 1994. Soil Microbial Dynamics: Short- and long-term effects of inorganic and organic nitrogen, *Soil Science Society of America Journal*, 58(3), pp. 801–806

<sup>3</sup> Treseder LK. 2004. A meta-analysis of mycorrhizal responses to nitrogen, phosphorus, and atmospheric CO<sub>2</sub> in field studies. *New Phytol.* 164, pp. 347–355

<sup>4</sup> Velthof G, Barot S, Bloem J, Butterbach-Bahl K, DeVries W, Kros J, Lavelle P, Oleson JE, Oenema O. 2011. Nitrogen as a threat to European soil quality. In *The European nitrogen assessment: sources, effects and policy perspectives* (eds Sutton M, Howard CM, Erisman JW, Billen G, Bleeker A, Grennfelt P, van Grinsven H, Grizzetti B.), pp. 495–512 Cambridge, UK: Cambridge University Press; Tripathi, S, Srivastava, P, Devi, RS, Bhadouria R, 2020. 'Influence of synthetic fertilizers and pesticides on soil health and Soil Microbiology', *Agrochemicals Detection, Treatment and Remediation*, pp. 25–54.

10. As a result of increasing fertiliser applications, soil structure across the UK has worsened, and arable soils have lost between 40% and 60% of their organic carbon. Almost 4 million hectares of soil are at risk of compaction in England and Wales, affecting soil fertility and increasing risk of flooding.<sup>5</sup> Building healthier soils with more soil organic matter results in higher water retention, meaning excess nitrates are less likely to leach into surrounding ecosystems and waterways, reducing detrimental impacts on biodiversity.

**How can the Government measure progress towards its goal of making all soils sustainably managed by 2030? What are the challenges in gathering data to measure soil health? How can these barriers be overcome?**

11. **A key pillar of sustainable soil management is the volume of inputs added to the soil, where these inputs are sourced and where they end up.** While in many systems, nitrogen is a necessary input to achieve yield targets, a narrative has been fed to farmers that greater inputs leads to greater yields.
12. As a result, use of inorganic nitrates has become rampant and unrestrained. Compounding this issue is the fact that Government has no whole dataset accounting the amount of nitrogen fertiliser applied to soils across England. Having an up to date picture of what quantity of nitrogen fertiliser is being applied to the soil will enable more updated analysis of the effectiveness of regulations, and inform further policy.
13. **Using a national balance sheet to quantify the nitrogen within the system will enable Government to evaluate the current state of England's soils, before being able to identify intervention points and measure progress towards sustainably managed soils.**
14. Currently it is a regulation requirement for farms to have nutrient management plans within Farming Rules for Water, yet this has also been included as a standard within the Sustainable Farming Incentive (SFI), meaning taxpayers money will be used on what should be the regulatory baseline. Government should properly enforce regulation for farms to have nutrient management plans and use the SFI to reward reductions in wasted nitrogen. If collected from all land owners by Government, the data from nitrogen management plans could formulate the basis of the agricultural flow of nutrients into the nitrogen cycle within the nitrogen balance sheet. Government could go further by requiring a detailed synthetic nitrogen reduction strategy below a certain level (i.e., a farm-level nitrogen budget) dependent on farm production and soil type.
15. **Greater accountability and regulation is needed for companies producing livestock slurry.** A significant source of excess nitrogen in soils is organic fertiliser, i.e. slurry and

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<sup>5</sup> Environment Agency, 2019. 2021 River Basin Management Plan.

faecal matter from intensive livestock production. The companies operating intensive livestock units (especially chicken and pig factories) often dispose of waste - untreated - to local farmers and landowners, to be spread on land. Excess slurry washes into rivers, and has led to nutrient pollution in waterways. Companies operating intensive livestock units must be included in Nitrogen balance sheets. They must fully account for their waste, including full disclosure of disposal volumes, treatment and processes. When local farms are saturated, further 'dumping' of excess slurry must be prohibited.

### **Do current regulations ensure that all landowners/land managers maintain and/or improve soil health? If not, how should they be improved?**

16. **Soil health is inextricably linked to the application of inputs**, as well as other key factors such as nutrient availability, organic carbon inputs and micronutrients. As such the Collaboration has reviewed regulations relating to nitrogen.
17. Much of UK regulation around nitrates has been transposed from EU law, largely by secondary legislation and complemented by guidance. The primary regulation around nitrate pollution is the Water Framework Directive, established for the assessment, management, protection and improvement of water quality. It stipulates a status of good water quality in all bodies of surface and ground water by 2015, which was missed, or by 2027 at the latest. The good ecological status of rivers has actually decreased in recent years, from 21% in 2014 to 14% in 2014, with agricultural pollution as a primary pollution source.<sup>6</sup> Recently, Government has delayed the target year to achieve good status of water quality till 2063 which demonstrates a real lack of ambition in cleaning up our natural environment.
18. Excess nitrogen causes a wide range of damage, including to soil health and fertility, and as such the predominant regulation should not be unambitious, transposed secondary legislation mainly focused on water. Government should introduce new primary legislation to reduce nitrogen pollution that creates a legal framework for all relevant government departments and local authorities to meet nitrogen reduction commitments, working across departments to meet targets. The nitrogen issue must be considered as a system, so as to avoid unintended consequences from siloed approaches by different government departments.
19. The Nitrates Directive 1991 also aims to protect water quality across Europe by preventing agricultural pollution. Under this jurisdiction, 58% of land is designated as a Nitrate Vulnerable Zone (NVZ),<sup>7</sup> but the Environment Agency is grossly underfunded and unable

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<sup>6</sup> Environment Agency, 2018. State of the Environment Report: Water.

<sup>7</sup> Environment Audit Committee, 2018. UK Progress on Reducing Nitrate Pollution, Eleventh Report of Session 2017-19, House of Commons.

to enforce the rules properly. Targets to improve enforcement of farm regulations are unambitious, with the new target of 4000 farm inspections per year covering just 4% of the total farm holdings (105,200 in 2021).<sup>8</sup> Compared to the NVZ area of 58%, the target of farm inspections on 4% of total farm holdings is insufficient. If farms are required to limit nitrate inputs on this area of land, enforcement must match regulation.

**20. The maximum amount of nitrate applied within NVZs (Nmax) is substantially higher than the limit that would allow surrounding environments to recover from the substantive pollution that has driven the allocation of an NVZ to an area.**

This can be inferred as no NVZs have been removed since 2017,<sup>9</sup> and nitrate concentrations actually rose in the years 2017-2019.<sup>2</sup> Moreover, we recommend that the Nmax limit should apply as a maximum limit of each field, rather than the current system where it applies to the average nitrogen application rate for that crop type across a farm.<sup>10</sup> Seeing as nitrogen can travel long distances from source points, biodiversity, soil health and ecosystems are at risk even far from the point of application.

21. The Farming Rules for Water were introduced in 2018 to help implement the Water Framework Directive. The main aim is to keep soil on land, match nutrients to crop requirements and keep livestock fertilisers and manures out of the water. The Environment Audit Committee (EAC) welcomed the Farming Rules for Water in their 2018 report, 'UK Progress on Reducing Nitrate Pollution', while also identifying the need to support the rules with good advice and information for farmers. The EAC also emphasised the importance of data and evidence collection to monitor the impact of the rules on improving water and soil quality, as well as the provision of sufficient resources to regulators to ensure compliance.<sup>4</sup>

22. As evidenced earlier, enforcement of rules around nitrogen applications do not match regulation. Further, the Farming Rules for Water have not been effective thus far because they have not been communicated or enforced. As a result, awareness of the rules is extremely low. The Sustainable Soils Alliance claims that there is no evidence that the Farming Rules for Water have had any effect in reducing nutrient diffuse pollution from agriculture.<sup>11</sup> In tandem with novel primary legislation focused on reducing nitrogen pollution across all impact areas, current regulation must be properly enforced and made clear to landowners and land managers.

23. Regulation 4(1)(a) of Farming Rules for Water states that a land manager must ensure that, for each application of organic manure or manufactured fertiliser to agricultural land, the

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<sup>8</sup> Environment Agency, 2023. Working to reduce pollution from farming. Accessed on 22/06/2023.; Department of Environment, Food and Rural Affairs, 2022. *Agriculture in the UK Evidence Pack*.

<sup>9</sup> Department for Farming, Food and Rural Affairs, 2018. *Nitrate Vulnerable Zones*, accessed 22/06/2023.

<sup>10</sup> Farming advice service, 2021. FAS Nitrate Vulnerable Zone 2020 webinar Q&A v0.2.

<sup>11</sup> Sustainable soils alliance, 2021. Response to the: 8 Farming Rules for Water DEFRA Regulatory Review.

application is (i) planned so that it does not exceed the needs of the soil and crop on that land, or (ii) give rise to a significant risk of agricultural diffuse pollution.<sup>12</sup> It is hard to quantify when fertiliser application is effective as there is no clear guidance on this, only a calculator provided by DEFRA which calculates the required fertiliser predominantly based on what is cost-effective, rather than a calculation based on environmental impacts. Government should provide more support to land managers to make calculations of soil requirements based on environmental and economic analysis.

**Will the standards under Environmental Land Management schemes have sufficient ambition and flexibility to restore soils across different types of agricultural land?**

**What are the threats and opportunities for soil health as ELMs are introduced?**

24. The Sustainable Farming Incentive (SFI) aims to reduce environmental harms resulting from the agricultural sector. Supporting farmers using agroecological practices that work with the natural environment of the farm, as well as protecting the surrounding area would deliver the aim of the SFI. However, there is little evidence currently that farmers will be properly compensated for implementing such practices, and so farmers on smaller farms are having to diversify in order to guarantee sufficient income. Some farms are doing this by intensifying production, which has greater income guarantees by production giants like Cargill, but also has detrimental impacts on the surrounding environment. If payments don't effectively support the farmers implementing better practices, they will resort to the greater income stream.
25. Recent analysis by the World Bank estimates that input subsidies have been responsible for 17 percent of global nitrogen pollution in recent years. Standards under ELM should be used to restore soil health by incentivising the sustainable use of fertilisers through paying for optimal applications of fertiliser, matched by regulation and penalties for overapplications.
26. Additionally, the nutrient management standard currently outlines payments for nutrient management plans. However, this is already a regulation requirement within Farming Rules for Water, although these regulations are barely enforced. Government could use the SFI to encourage farmers to implement a nitrogen budget, where farms using chemical inputs below a certain threshold receive the highest payment, and those proven to be reducing applications receive mid-tier payments. This would go hand in hand with a nutrient management plan which should be a regulation requirement, and used to identify the soil and crop needs prior to fertiliser applications.

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<sup>12</sup> UK Legislation, 2018. The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018. Accessed on 22/06/2023.