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Role of biomass in achieving net zero consultation – Joint-response supported by Feedback Global, Soil Association, Sustain, Biofuel Watch, and Friends of the Earth England, Wales & NI.

We welcome the chance to respond to the government's Role of biomass in achieving net zero consultation. This joint-response focuses specifically on the use of biomass for anaerobic digestion plants – including bioenergy crops, food waste, manures and slurries. Each section below is marked with the consultation questions which it is most relevant to.

Anaerobic Digestion (AD) of biomass feedstocks such as wastes and bioenergy crops is often a suboptimal use of land and resources, and must therefore be kept within its sustainable niche as a last-resort waste management option[1]. Any support for the growth of AD must be designed in a manner which does not undermine waste prevention efforts or divert land from environmentally preferable uses. This can be achieved by the following means:

1. Prioritise government investment and support to preferable alternatives to AD – such as a just transition to less and better meat, food waste regulation, planting and restoring biodiverse woodlands and forests, agroecological production of plant-based proteins, solar PV and wind energy, and faster electrification of heat and transport.
2. Raise/increase taxes on or ban worse alternatives to AD – such as landfill/incineration of food and green waste as well as open manure storage.
3. Set a minimum "floor" price for the gate fees AD plants charge for waste collection – this would raise the costs of waste disposal (disincentivising waste according to the polluter pays principle) and boost AD incomes (reducing reliance on subsidies).
4. Remove support for bioenergy crops, and AD plants which use bioenergy crop feedstocks.
5. Remove government support for intensive livestock facilities in the UK, and increase regulations to make it more difficult for intensive livestock facilities to gain planning permission (including those with AD plants fitted).

Potential of AD within its sustainable niche **(relevant to Q2. a) and c))**

A Life Cycle Assessment by researchers at Bangor University modelled what a sustainable niche for AD would look like in a net zero context – where AD plants had as available feedstocks all food waste leftover after food waste had been halved, 100% of slurries and manures from UK livestock were sent to AD after the UK's total meat and dairy production and consumption had halved, and no bioenergy crops were used. This yielded 12.8 TWh of energy from AD[1,2]. When AD is kept within its sustainable niche in this way, land is spared for solar PV, food production and afforestation, which means that considerably more energy, food production and carbon sequestration occurs in this Circular scenario compared with a scenario where AD growth is maximised[3]. In this optimal scenario, 5.9 million tonnes of food waste and 68.7 million tonnes of manure and slurries are available for AD.

Reduce support for bioenergy crops **(relevant to Q3, Q6, Q10, Q12, Q15 and Q17):**

There are significantly better uses of land than AD bioenergy crops from the perspectives of energy generation, emissions mitigation and food security:

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[1] This is based on the underlying dataset for Styles et al (2020), where 46205989018.1337 MJ per year in potential energy electricity generation were found to be produced from AD in the circular scenario and net zero context. This was converted to TWh using this conversion tool.

- **Energy:** Solar PV generates 12-18 times more energy per hectare than maize or grass grown for AD, in the current context[4].
- **Emissions**: Planting trees saves 11.5 times more emissions per hectare than growing grass as a bioenergy crop, in the current context. This should be through planting and restoration of biodiverse woodlands and forests. By a net zero context, AD using grass feedstocks would actually be a net emitter of +20 kg CO_2 eq. per tonne of grass sent to AD - even if CCS was fitted to AD plants[5]. This is because AD results in negligible fossil displacement in a decarbonised energy sector, but still leads to soil emissions, methane leakage and digestate emissions.
- **Food security and soil health**: The land the ADBA aspires to use for bioenergy crops for AD could instead be used to grow enough peas to feed 1 million people per year, which grown in rotation is much better for soils than maize[6]. 75% of sites with late harvested maize show high or severe levels of soil erosion[7].

We therefore recommend that subsidies to bioenergy crops and AD plants use bioenergy crops be removed, with investment transferred to the more efficient alternatives cited above. Perennial crops like miscanthus and willow are better suited to use as biomass fuels, such as heat pellets, which is their main current use[8], rather than as AD feedstocks.

Prioritise regulation and investment for faster food waste prevention (relevant to Q3, Q6, Q10, Q12, Q15 and Q17):

The government's statutory guidance on the Food and drink waste hierarchy for dealing with surplus and waste clearly states that food waste prevention and animal feed should be prioritised over sending food waste to AD[9]. These destinations are environmentally preferable to AD:

- **Food waste prevention:** Preventing food waste results in direct emissions savings approximately 9 times higher than sending it to AD, per average tonne of food waste – and 40 times higher when spared grassland used to produce this food is instead afforested[10].
- **Animal feed:** Sending food waste to animal feed saves nearly 3 times the emissions as sending it to AD – in addition to sparing extra cropland for food production[11].

Reducing UK food waste by 5.9 million tonnes (a 50% absolute reduction in 2015 food waste levels from farm to fork), with afforestation on the roughly 3 million hectares of grassland spared by this, would save approximately 51 million tonnes CO2eq domestically and overseas[12]. Of this, an estimated 18.4 million tonnes CO2eq would occur domestically, equivalent to a 40% cut in the UK's 2018 agriculture-sector emissions (4.9 million tonnes CO2eq directly from food waste prevention and 13.5 million tonnes CO2eq from planting trees on spared grassland) with the rest occurring overseas (through reduced food imports and afforestation on spared grassland)[13]. In addition, halving UK food waste would save approximately 0.8 million hectares of cropland (nearly half of this domestically) which could produce enough potatoes and peas to feed 28% of the UK population with all of the calories they need annually[14]. 5.9 million tonnes of food waste would remain available for AD. In contrast, WRAP's Food Waste Reduction Roadmap currently aims to reduce post-farm-gate food waste by only 2.5 million tonnes[15] - less than half of the food waste prevention modelled in the scenario above, resulting in large volume of avoidable edible food waste going to AD. The UK faces a great opportunity to accelerate action on food waste through regulation. Voluntary measures have resulted in slow and untransparent action - in 2020 there are still only 60 businesses in the UK who have publicly reported their food waste data[16], food waste in the retail, manufacturing and Hospitality and Food Service (HaFS) sectors has only been cut by 0.23 million tonnes between 2011-18 (roughly 1% reductions per year)[17], and primary production food waste is locked out of national reduction targets due to lack of data. The government has an opportunity to introduce mandatory food waste reporting and reduction targets, which if implemented within the next year, could unlock the significant benefits of greater food waste action.

Prioritise a just transition to less and better meat (relevant to Q3, Q6, Q10, Q12, Q15 and Q17):

Whilst using manures and slurries as AD feedstocks to generate biomethane mitigates some of these emissions effectively, it results in significantly lower emissions mitigation than dietary shifts to more plant-based diets – which prevents the manures and slurries arising in the first place, in addition to other savings such as those related to animal feed and enteric fermentation. Government funding and regulation should therefore focus on means of incentivising and accelerating a just transition to less and better meat. If current trends continue, the global meat and dairy industry will account for almost half of the world's 1.5°C emissions budget by 2030[18]. Reversing this trend is thus an essential part of tackling the climate crisis. Every Climate Change Committee (CCC) net zero scenario includes dietary change, with the CCC calling it "particularly important"[19]. Over half of the emissions abatement modelled in the CCC's Balanced Net Zero Pathway scenario for the agriculture sector is achieved through "diet change and food waste"[20].

Even if 120 million tonnes (85%) of the UK's manure and slurries were sent to AD (which is highly unlikely to be economically feasible), it would only bring down UK agriculture emissions by a maximum of 12.1 million tonnes CO_2 eq (27%)[21]. Even if this were economically viable, by the time this AD capacity were built, the decarbonisation of the energy grid and other factors would mean that average emissions mitigation per tonne of manure of slurry would decline (for instance, by roughly 40% in an 80% decarbonisation context)[22]. In contrast, a CCC-commissioned report estimated that a 50% reduction in just the UK's beef, lamb, and dairy consumption by 2050 could result in a 37% reduction in the total UK agricultural sector's domestic emissions[23], and free up an estimated 4.2 to 6.9 million hectares of grassland[24]. If trees were planted on 4.2 million hectares, this would result in an additional estimated 54 million tonnes CO_2eq annual average carbon sequestration by 2032[25] (more than the entire UK agriculture sector) and biodiversity benefits. The CCC's Balanced Pathway scenario finds that even comparatively modest dietary change of a 20% reduction in meat and dairy consumption by 2030 rising to 35% by 2050 would deliver emissions reductions of 7 $MtCO_2e$ per year[26] and spare 3 million hectares of land domestically[27] by 2035. This, combined with the opportunities of speeding UK food waste reduction, creates a pathway to net zero agriculture by 2040 without recourse to BECCS. Feedback models that in a scenario where UK meat and dairy production has halved, a theoretical maximum of 68.7 million tonnes of manure and slurries would still be available for AD.

Ensure AD plants do not lower waste disposal costs and create perverse incentives (relevant to Q3. Q10, Q12, Q15 and Q17):

The government must ensure that policies designed to support waste management through AD do not inadvertently disincentivise more environmental outcomes such as waste prevention.

If AD gate fees are low or even negative, this can lower the costs of food waste disposal, thus reducing incentives to prevent food waste, or send use it for animal feed. For instance, chairman of the Scottish Tenant Farmers' Association recently condemned the fact that increasing volumes of distillery draff and pot ale syrup have been diverted from animal feed to AD in recent years – driving Scottish livestock farmers to become more reliant on imported soya[28]. A House of Lords enquiry into food waste heard evidence that "there is a clear temptation, on economic grounds, to prioritise energy recovery"[29]. To remedy this, the government should consider the introduction of a minimum "floor" price for gate fees charged by AD plants for waste, which could optionally be raised over time

- this will boost the income of AD plants (reducing reliance on subsidies) whilst also ensuring that the costs of disposal to AD are high enough to be a disincentive to waste prevention (for food waste and manures and slurries), in line with the polluter pays principle. The government should combine the mandatory separate food waste collections being introduced by 2023 with increased taxes on incineration and landfill to ensure these disposal options are even more expensive than AD.

Low or negative AD gate fees can also lower the cost of manure and slurry disposal, thus inadvertently making intensive livestock facilities more economically viable – incentivising more and worse meat production and an associated growth in the volume of manures and slurries[30]. For instance, to facilitate Northern Ireland's Going for Growth strategy[31], AD plants were highly subsidised as an outlet for poultry litter. Previously, disposing of poultry waste cost up to £90 a tonne[32] – but with heavily subsidised AD plants, Moy Park started collecting waste from its contracted farmers and selling it to the digester operator[33], saving Moy Park at least £12 million per year plus an unknown income from selling the chicken litter[34]. As a result of the Going for Growth strategy, the size of the pig herd in Northern Ireland increased by 41% and the number of poultry increased by 30% between 2013 and 2019, mainly in intensive livestock facilities[35]. To remedy this, the government should introduce the minimum "floor" price for AD gate fees mentioned above, make it compulsory for intensive livestock facilities to fit AD plants to digest their manure and slurries (without financial support given for this), increase taxes on methane and nitrate emissions, and bring forward the ban on open manure storage from 2027 to 2024. This ensures that, in line with the polluter pays principle, these facilities pay for the costs of mitigating their emissions, making the UK's highest-emissions meat production less economically viable. This should be complemented with increased taxes on meat imports to ensure domestic production is not undercut by imports with lower environmental standards – and financial support for a just transition to more plant-based proteins production and smaller-scale agroecological meat production. Finally, the government should ensure that it is not easier for intensive livestock facilities to gain planning permission on the basis of building AD plants[36].

Factor the opportunity costs of AD into cost-benefit comparisons with faster electrification (relevant to Q8, Q15, Q16 and Q20):

When doing cost-benefit analyses of AD compared with faster electrification, it is essential to move beyond a narrow focus on how to decarbonise energy, heat and transport, to examine the opportunity costs of using land and biomass feedstocks for AD compared with alternatives such as less and better meat, food waste prevention and afforestation[37]. This will require a broadening of scope to consider the agriculture and land use sectors. Once these considerations are factored in, it is possible that faster electrification of heat and transport may become more attractive, reducing the need for biomethane from AD in the energy mix. Faster electrification is in many cases possible with more ambitious investment, reducing the need for biomethane as a bridging technology. For instance, it is estimated that 65% of the UK's long-haul freight vehicles could be electrified through an Electric Road System by the 2030s at a cost of £19.3 billion – with the remaining 35% mainly urban deliveries which are expected to shift to electric battery lorries over the next 10 years[38]. Building excessive biomethane infrastructure now may risk "locking in" gas infrastructure.

Digestate (relevant to Q8, Q12 and Q15)

Currently, 62% of land in England and 4% in Wales is classified as nitrate vulnerable zones (NVZs)[39], so digestate's high readily available nitrogen content makes it vulnerable to ammonia emissions and leaching nitrates if spread in already overloaded areas[40]. In some countries, such as Italy, there is a requirement to post-compost digestate[41] - this requirement could be replicated in the UK as part of a transition to improve the long-term health of UK soils.

End notes:

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[3] Styles et al.
[4] Styles et al. SI B5.
[5] Styles et al.
[6] Bowman and Woroniecka, 'Bad Energy: Defining the True Role of Biogas in a Net Zero Future'.
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[10] Styles et al., 'Identifying the Sustainable Niche for Anaerobic Digestion in a Low Carbon Future'.
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[12] Styles et al.
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[18] Helen Harwatt and Matthew N Hayek, 'Eating Away at Climate Change with Negative Emissions: Repurposing UK Agricultural Land to Meet Climate Goals' (Harvard Law School, 11 April 2019), https://growgreenconference.com/sites/default/files/uploads/Eating%20Away%20at%20Climate%20Change%20with%20Negative%20Emissions.pdf.
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[20] Committee on Climate Change, 166 Fig 3.6.b.
[21] Bowman and Woroniecka, 'Bad Energy: Defining the True Role of Biogas in a Net Zero Future'.
[22] Feedback, 'Bad Energy: Defining the Role of Biogas in a Net Zero Future' (London: Feedback, 2020), 54–55, https://feedbackglobal.org/wp-content/uploads/2020/09/Feedback-2020-Bad-Energy-report.pdf.
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[25] Harwatt and Hayek, 'Eating Away at Climate Change with Negative Emissions: Repurposing UK Agricultural Land to Meet Climate Goals'.
[26] Committee on Climate Change, 'The Sixth Carbon Budget: The UKs Path to Net-Zero', 165.

[27] Committee on Climate Change, 'The Sixth Carbon Budget - Methodology Report' (Committee on Climate Change, December 2020), 222, https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-Methodology-Report.pdf Fig 7.7.
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