Project Summary and Key Takeaways

Developing a carbon accounting methodology for compost and digestate under the Greenhouse Gas Protocol

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Project Summary

The Research Hub commissioned AECOM to deliver a project titled *Developing a carbon accounting methodology for compost and digestate under the Greenhouse Gas Protocol*. The aim of this project is to provide compost producers and AD operators with a methodology to account for the greenhouse gas (GHG) impact associated with their products.

The two research objectives and key outcomes for each are outlined below.

> **Objective 1:** To demonstrate to compost producers and AD operators the benefits of engaging with the GHG protocol as a key step towards understanding their commercial activities within the global imperative to minimise climate-warming emissions.
>
> **Objective 2:** To provide guidance to operators on how to account for the production and application of compost and digestate under the GHG Protocol.

Obj. 1: What are the benefits of engaging in carbon accounting?

Key reasons compost and digestate producers may wish to engage in carbon accounting include:

- Climate crisis – The agriculture sector is uniquely at risk of the impacts of climate change but also a significant source of emissions, contributing 11% to the UK's total emissions in 2020 (DEFRA, 2022). The production and use of nitrogen synthetic fertiliser alone accounts for an estimated 2% of global emissions (Menegat et al., 2022). Compost and digestate producers can help decarbonise the agriculture sector by encouraging the use of organic alternatives if they can demonstrate their lower carbon intensity via carbon accounting.
- Market forces – Consumers increasingly consider the environmental impact of their consumer choices, leading industries to promote the environmental benefits of their products. However, any claims must adhere with regulations such as the EU Green Claims Directive, as well as industry specific guidance. Carbon accounting (e.g., 'footprinting') can provide a quantitative indicator of a product's carbon impact.
- Regulatory forces - For larger organisations GHG reporting and climate-related disclosures are already mandatory.

Obj. 2: How can compost and digestate producers conduct carbon accounting?

The report provides a contextual overview of the GHG Protocol focusing on relevant Standards and key carbon accounting principles. It also contains a methodology digestate and compost producers can follow to calculate and report the GHG emissions associated with these products.

Overview to the GHGP

The GHGP is a globally recognised initiative for accounting and reporting GHG emissions, comprised of a suite of standards and guidance documents that work together. Standards set the reporting requirements and guidance provides clarity on how business and governments can best quantify the emissions associated with their activities against a particular standard.

This project focuses on the use of the Product Life Cycle Standard to calculate GHG emissions for compost/digestate through five life stages (below) and contains guidance on alignment with the Corporate Standard (i.e., Scopes 1, 2 and 3) to allow users to calculate their organisational emissions if desired. Guidance documents for the Product Life Cycle and Corporate Standards as well as the draft Land Sector and Removals Guidance were reviewed to produce the methodology.

A comprehensive overview of carbon accounting and the Greenhouse Gas Protocol, including each of the relevant standards and guidance documents can be found in Annex A of the report.

A Methodology for Compost/Digestate Product Footprinting

The first step in creating the methodology was to define the scope and boundaries for a compost/ digestate Product Lifecycle Assessment. The products' life cycles were reviewed and sources of GHG emissions were identified at each life stage. This formed the foundation of the methodology.

The methodology sets out a suite of potential activities at each stage of the product's lifecycle (below) and presents the corresponding data required to calculate emissions at each stage, using the following equation: *Activity data * Emissions factor = GHG Emissions (tCO_2e).*

- **Raw Material** accounts for input of materials to create the product, including packaging for bagged material. Here, the input is assumed to be waste (note: under the GHGP, waste has no allocated emissions or removals). Annex C covers how to manage crop inputs.
- **Production** covers activities dependent on the production process such as activities that require energy and water. This also considers energy generated on site and how to allocate emissions for processes resulting in more than one product (e.g., biogas and digestate).
- **Distribution** accounts for the fuel consumption of transportation used to distribute products to the end customer.
- **Use** considers the application of compost and digestates to soils, as well as the land emissions associated with nitrification (direct and indirect) and volatilisation.
- **Disposal** generally considers a product's end-of-life. Compost or digestate will be added to soils during the 'use' phase and in terms of product GHG accounting, this will be the end of its lifecycle. However, for packaged material, disposal of packaging should be included.

Compost and digestate producers must consider their processes and input the data relevant to their specific product. Example calculations are included to show how to use the methodology but should not be used as a 'catch-all.' Each product is unique, and your accounting must reflect this.

The report also contains several Annexes which contain further supporting information:

- Annex A: Overview of GHG Accounting
- Annex B: Land Sector and Removals sample reporting template
- Annex C: Purpose-grown Crops – how to manage non-waste inputs
- Annex D: Literature review – used to define scope and boundaries of the assessment
- Annex E: Frequently asked questions
- Annex F: Example calculation: CO2e emissions from the production of one tonne of purpose-grown crop liquor digestate
- Annex G: Spreadsheet containing additional worked examples and supporting information

Key Takeaways

- The project report contains an introduction to the Greenhouse Gas (GHG) Protocol and carbon accounting principles as well as a comprehensive methodology that compost and digestate producers can use to conduct a 'product footprint assessment' of their product(s).
- The project began by setting the scope and boundaries of a typical compost/digestate GHG assessment by reviewing the lifecycles of these products and pinpointing all likely sources of carbon emissions in order to identify what data is required to carry out each assessment.
- Once the data requirements are identified, emissions are calculated via the equation:

  *Activity data * Emissions factor = GHG Emissions (tCO_2e)*

  - Activity data – activities in a specific product's lifecycle (ideally site-specific)
  - Emission factors – used convert activity data into reportable GHG emissions
- The methodology focuses on the Product Lifecycle Standard, which is used to perform a carbon 'footprint' for a specific product (e.g., compost or digestate) by assessing emissions throughout its lifecycle – from materials, manufacturing, and distribution, to use and disposal.
- For a process resulting in more than one product, (e.g., biogas and digestate), allocation rules dictate how emissions are divided.
- The methodology also provides guidance to align product footprint assessments with the Corporate Standard to assess company-wide emissions (scopes 1, 2 and 3).
- The (draft) Land Sector and Removals (LSR) Guidance explains how emissions and removals (i.e., sequestration of atmospheric carbon) are accounted within the land sector. For compost and digestate, land-based activities include growing organic inputs and application to land.
- The GHGP defines waste as "an output of a process that has no market value" and, hence, wastes have no allocated emissions or removals. Therefore, composting/AD sites taking waste inputs (i.e., food/garden waste) are unlikely to have allocated land-based emissions/removals.
- Whilst there are no direct emissions associated with waste feedstocks, there are emissions associated with the transportation of the feedstocks to production facilities. The embodied carbon and transport of any additional inputs (e.g., packaging) should also be considered.
- Guidance for sites taking non-waste crop inputs can be found in Annex C. Even for non-waste-derived products, the LSR Guidance specifies that any activities that may result in carbon sequestration must be monitored indefinitely to demonstrate permanent carbon storage (i.e., whether carbon stored in soil remains there or is re-emitted into the atmosphere over time)
- A key strength of the product footprint assessment approach is that it allows the producer to demonstrate the carbon associated with their product against other related products on the market (e.g., mineral fertilisers)
- The GHGP is limited to providing a framework for carbon accounting. The additional benefits from using these materials (e.g., improving soil structure and enhancing crop growth and carbon storage) should be recognised but must be accounted by another means.
- Chapter 5 of the report identifies several areas for potential future work.