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AGTECH

# Summary of conclusions and recommendations from Defra's report on Harmonisation of Carbon Accounting Tools for Agriculture

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# Contents

Foreward	3	System boundaries	15
Executive summary	4	Data requirements	16
Comparison of carbon calculator tools	6	Reporting	17
Tools for advancing agriculture and sustainability	8	Soil carbon sequestration	18
Variability between the tools and harmonisation	9	Peat soils	19
Standards	10	Woodland sequestration models	20
Evidencing good practice	12	Methods for direct livestock emissions	21
Transition to net zero	13	Nitrous oxide methodologies	22
Benchmarking	13	Global methodologies	23
Economic incentives	13	Standardised emissions factors	23
Supporting farmer decision making	14		
Fungibility	14		



*Sandy's distinctive strengths provide farmers and the supply chain credibility, along with tangible benefits, to drive a more sustainable and profitable agricultural future.*

# Foreword

In this report by Trinity AgTech, we provide an objective overview of Defra's report published in January 2024, following their year-long investigation and study on "Harmonisation of Carbon Accounting Tools for Agriculture". We objectively review their key findings and recommendations, highlighting how Sandy uniquely leads the way in intelligent precision navigation for food and farming. Plus, we share insights into our innovative process of creating the ground-breaking Sandy Natural Capital navigator.

Trinity AgTech is known for its service-oriented, virtuous, forward-thinking ethos and a strong presence in the United Kingdom, the European Union and beyond. As you explore the report's main findings, you'll notice that Defra's assessment confirms Sandy is uniquely fit for purpose as an innovative software solution revolutionising farmers' agricultural operations, distinctively helping the sector achieve an agricultural transition in which everyone benefits: the all-win outcome.

Sandy is designed from the ground up to leverage the latest and most effective strategies and technologies in science, farming, and technology. At Trinity AgTech, our priority is the interests of our clients and the professional growth of innovative communities.

Sandy sets itself apart as a new generation of intelligent navigation software designed to cater to the changing requirements of farmers and key sector stakeholders. We leverage the most up-to-date scientific and technological advances and farming innovations to provide secure, efficient, and long-lasting solutions that benefit stakeholders.

*Our mission is to deliver fair, efficient and virtuous outcomes for the transition to net zero, food security, supply chain resilience, and rural community prosperity.*

Our approach to industry challenges is characterised by our commitment to avoiding oversimplification of farming, over-trivialisation of what Defra repeatedly calls a "complex" endeavour, staying continuously proactive, and steering clear of fear-based tactics.

We focus on practical, trustworthy, protocol-compliant, innovative solutions that create value. As a result, Sandy stands out from the first-generation tools and is uniquely suited to address current challenges and seize opportunities for personal and business growth and resilience.

We're proud of this achievement and thank Defra, its investigators, and reviewers for their rigorous efforts in ending confusion, greenwashing, pseudo-science, and box-ticking practices.

We thank all sector stakeholders for their support in developing Sandy and related platforms over the past four years, including:

- farmers
- processors
- manufacturers
- grocery retailers
- accountants, investors and trustees
- rural consultants
- banks
- scientists
- technologists
- standard and protocol verifiers
- and countless other organisations and individuals.

To find out more information about Trinity AgTech's analysis of the Defra report, visit [www.trinityagtech.com/defra-report](http://www.trinityagtech.com/defra-report)

To read the full Defra report, please visit [sciencesearch.defra.gov.uk](https://sciencesearch.defra.gov.uk) and search for project SCF0129.

# Executive summary

Trinity AgTech provides an objective and comprehensive analysis of a year-long investigation by the UK's Department of Environment, Food and Rural Affairs (Defra) with ADAS, titled "Harmonisation of Carbon Accounting Tools for Agriculture."

Defra's report, published in January 2024, reviewed 81 global carbon calculators, focusing on six for the UK farming context, including:

- Agrecalc
- Cool Farm Tool
- Eggbase
- Farm Carbon Calculator
- Sandy by Trinity AgTech
- Solagro's Farm Carbon Calculator.

Defra's report identifies Sandy as a standout tool, referred to as 'Calculator E' in Defra's report.

Key findings indicate that Sandy is uniquely fit for purpose in meeting all essential criteria. It thoroughly covers calculation, data, standards, and assessment scope, setting it apart as the only viable tool for stakeholders, including farmers, supply chains, and financial institutions, to assess carbon footprints and natural capital.

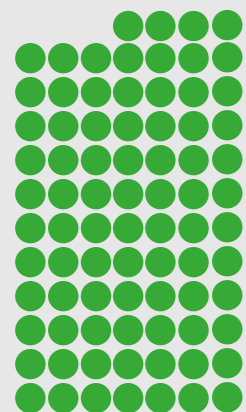
Sandy's strengths are highlighted in providing credible and actionable insights for driving sustainable and profitable agriculture. It aligns

with government targets for net zero emissions and supports sustainable practices, thus avoiding greenwashing. Trinity AgTech's Sandy platform integrates various standards, such as the IPCC 2019, SBTi FLAG, GHG Protocol, ISO 14064:2 and ISO 14067, ensuring comprehensive and reliable analysis.

The report underscores the importance of accurate accounting for soil carbon sequestration and peat soils, with Sandy using robust Tier 2/3 methodologies. Furthermore, Sandy offers advanced features like scientific benchmarking, optimisation journey, and scenario planning to support decision-making for farmers, enabling them to adapt to changing circumstances and reduce emissions.

In conclusion, Sandy by Trinity AgTech emerges as a comprehensive tool that not only meets but exceeds the recommendations of the Defra report. It provides farmers a clear path to sustainable best practices and facilitates the transition to net zero, contributing to food security, supply chain resilience, and rural community prosperity.

81 tools identified



10 short-listed based on:

- Relevance
- Accessibility
- Uptake within the sector
- Availability of supporting resources



6 further short-listed based on:

- Availability for investigation
- A poultry-specific tool added



4 investigated across case study farms



Trinity's Sandy based on factors including:

- **System boundaries** – ISO 14064 and ISO 14067
- **Data entry** – machine learning and artificial intelligence
- **Emissions factors** – alignment to standard databases
- **Calculations & assumptions** – consistent use of IPCC 2019 Tier 2/ Tier 3
- **Land-based carbon removals and emissions** modelling & primary data
- **Quantification of mitigation** – inclusion of mitigation practices and mitigation opportunities



Defra's report reviewed 81 global carbon calculators, focusing on six for the UK farming context, identifying Sandy as a standout tool referred to as 'Calculator E' in Defra's report.



*Sandy excels at accurate carbon accounting for sustainable agriculture, leading the way to net zero emissions.*

# Comparison of carbon calculator tools

The calculators listed in this table are Agrecalc, Cool Farm Tool, Farm Carbon Calculator, and Sandy. **The Defra report refers to Sandy as calculator E.**

Scores have been allocated for scientific credibility as follows:

**Y** Yes    **N** No    **P** Partially    **?** Unknown

Defra report assessment criteria and findings	(A)	(B)	(D)	(E)	Defra Page ref
<b>Inclusions</b>					
Higher Tier modelled carbon emissions and removals from soils from land use (reported separately as required by SBTi)	N	N	N	Y	p.37, para.6
Soil carbon & biomass sequestration in permanent grassland systems	Y	N	Y	Y	p.18, para.6
Use of on farm measurement of soil carbon	N	N	P	Y	p.38, para.3
Capital, and consumable items and transport	?	?	?	Y	p.26, para.1
Explicit modelling of rotations (for organic farming)	N	N	N	Y	p.26, para.5
Reporting to GWP100 and GWP*	N	N	N	Y	p.32, para.7
Manure management based on IPCC 2019 guidelines	N	P	N	Y	p.35, para.7
Emissions from oxidation of peat	N	N	P	Y	p.38, para.4
Uncertainty estimation	N	N	N	Y	p.38, para.8
Nitrification inhibitors	N	Y	N	Y	p.41, para.3
Controlled release fertilisers	N	N	N	Y	p.41, para.3
Urease inhibitors	N	N	N	Y	p.41, para.3
Methane inhibitors	Y	N	N	Y	p.40, para.2
Anaerobic digestors	N	N	N	Y	p.25, para.3
Optimisation of carbon journeys towards net zero	N	N	N	Y	p.44, para.3
<b>Data</b>					
AI/ML enabled data input checking	N	N	N	Y	p.43, para.3
Up-to-date standardised dataset for embedded feed emissions for all livestock, with explicit accounting for land use change	N	P	N	Y	p.31, para.2
Fully flexible input for livestock data	N	N	N	Y	p.31, para.3-4
Feed and manure emissions based on actual intake and composition per livestock class	N	P	N	Y	p.31, para.3
Up-to-date embedded emissions in fertiliser	N	Y	?	Y	p.30, para.5
Benchmarking of results using reference data	N	N	N	Y	p.44, para.3
<b>Standards</b>					
Meets the requirements of ISO 14067	N	N	N	Y	p.25, para.6
Meets the requirements of ISO 14064:2	N	N	N	Y	p.39, para.2
SBTi ready	N	N	N	Y	p.25, para.6
Aligned with woodland carbon code	N	N	P	Y	p.37, para.4
Meets the requirements of BS 8632:2021	N	N	N	Y	p.45, para.2

Trinity's analysis	(A)	(B)	(D)	(E)
<b>Inclusions</b>				
Packhouse	?	?	?	Y
Perennial crops/tree planting	P	N	P	Y
Carbon analytics of controlled environment farming	N	?	N	Y
Biodiversity scoring	N	Y	N	Y
Biodiversity optimisation/decision analytics	N	?	N	Y
Water use, protection, and pollution	N	P	N	Y
Natural capital valuation	N	N	N	Y
Fully integrated farm management and economics	P	P	N	Y
End-to-end access to carbon marketplace	N	N	N	Y
Dedicated and integrated livestock feed carbon footprinting module	P	P	P	Y
Digital collaboration, engagement, and innovation platform	N	N	N	Y
<b>Standards</b>				
Consistent use of IPCC 2019 methods	N	N	N	Y
<b>Boundaries</b>				
Whole farm covering all enterprises	N	N	N	Y
Product carbon footprint meeting the requirements of ISO 14067	N	N	N	Y



*Sandy not only meets but exceeds the recommendations of the Defra report.*

# Tools for advancing agriculture and sustainability

## Defra's findings

All tools are referred to as 'calculators'. The report also anonymises tools. **Sandy is referred to as 'calculator E' in the report.**

## Trinity's analysis

The term calculators is appropriate for tools limited to calculating a footprint with:

- unclear limits or boundaries
- lack of accurate on-farm methods
- no obvious extra benefits
- no helpful direction or rewards for doing good things.

These limitations do little to help the agricultural industry evolve.

Sandy offers a complete data system. It gives accurate environmental information, like biodiversity, water, soil erosion, carbon, and natural capital valuation. Sandy also has tools to help farms become more sustainable and join carbon markets easily.

Farmers, supply chains, finance, and policymakers can use Sandy to transition to more sustainable food production. This means reaching net zero emissions, making more money, and improving the environment and society.

Sandy is a natural capital navigator. Our mission is to deliver fair, efficient and virtuous outcomes for the transition to net zero, food security, supply chain resilience, and rural community prosperity.

### The transition toward net zero

Sandy helps farmers measure and reduce carbon emissions effectively, aligning with chosen or specified government net zero targets.

**Using Sandy, farmers can showcase their dedication to reliable and trustworthy analytics and metrics, steering clear of greenwashing tools, suspicions, and pseudo-science and accessing incentives and support for sustainable practices.**

## Food security and supply chain resilience

Sandy ensures credible and compliant analysis with up-to-date standards and protocols, including:

- IPCC 2019
- SBTi FLAG
- GHG Protocol
- ISO 14064:2 and ISO 14067
- Environmental and production-related risk assessment meeting the requirements of BS 8632:2021

Sandy provides fungibility analysis, making it easier for farmers to compare environmental metrics across different enterprises, farms, and agricultural products. This helps farmers evaluate land use options and farming practices more efficiently, enhancing the resilience of the food supply chain.

**Farmers using Sandy can build trust with supply chain stakeholders and meet their sustainability requirements.**

### Prosperous rural communities

Sandy empowers farmers, landlords, and key stakeholders to make well-informed and credible decisions, earning trust within the national and international economic system.

This leads to increased capital flowing into the sector and a fair distribution of benefits and opportunities.

**Farmers can reduce the risks associated with their production and environmental decisions by using Sandy, leading to enhanced productivity, profitability, and overall sustainability.**

# Variability between the tools and harmonisation

## Defra's findings

There is a high level of divergence between the calculators attributable to various differences including:

- system boundaries
- accounting for soil carbon
- databases used
- methods to estimate nitrous oxide and methane emissions
- data granularity.

**The report wants to clarify that it's not saying one calculator is better or worse. Instead, it aims to provide insights that can guide an approach to make results more comparable.**

**It shows where calculators differ and suggests ways to improve them.**

## Trinity's analysis

**Sandy stands out as the only calculator that has already met or exceeded all the recommendations in the report.**

Sandy provides granular outputs using standards-defined system boundaries and the most refined models. It includes all essential sources and sinks of greenhouse gases and carbon, making it SBTi-ready.

Further, intelligent design supports the data-entry process. Artificial intelligence and machine learning help monitor and identify effective ways to reduce greenhouse gases and remove carbon.

Sandy, the software that meets all the sector's requirements today, doesn't need harmonisation for its users.

Farmers can't wait for a potential harmonisation process that might not occur, or for supply chain changes like SBTi standards and conventions already underway to catch them by surprise.

**Farmers need a tool that adheres to all relevant standards and offers a clear path to sustainable best practices.**

Sandy is crucial for achieving the goals set by policies and the industry for sustainable, net zero agriculture.

The supply chain aims to support this transition. But farmers need to come together around a calculation, reporting, and communication system. This will enable efficient and targeted support design at a business, country, and global level.

***Sandy is more than a calculator; it's an integrated platform for rigorous environmental data management.***

# Standards

## Defra's findings

The PAS 2050:2011 standard is out-of-date, particularly with reference to its exclusion of soil-based GHG removals.

*"this protocol omits many important sources of carbon sequestration since it only allows for consideration of carbon stock emissions and removals associated with land use change, so will be of limited value in assessing approaches to Net Zero."*

The report also highlights the business necessity of inclusion of soil-based greenhouse gas removals, linking calculators' ability to provide net zero solutions to *'corporate, national and international targets to decarbonise the agricultural and food system'*.

*"The shift in thinking from emissions assessment to Net Zero has led to changing needs from the calculators..."*

*...this has led to the development of the SBTi guidance, and the development of the GHG protocol Land Sector and Removals guidance..."*

**Calculators are increasingly pressured to align with these more modern standards.**

*'Currently, only calculator E is aligned with the needs of these as well as PAS 2050.'*

It also says that

*'it is important that calculators are presenting carbon removals (whilst taking into account additionality, permanence and leakage).'*

The recommendation is made that tools present reliable sequestration numbers in line with the following:

- ISO standards 14064:2 and 14067
- the draft GHG Protocol Land Sector and Removals guidance (supporting SBTi)

This will ensure that incentives and requirements around these targets are accessible to farmers.

# Standards

## Trinity's analysis

Calculators' find it difficult to guarantee that they meet standards, but Sandy is a navigator, and it can. It's scientific, accurate, and complete methods meet the requirements of ISO and SBTi.

**Sandy stands out for its unique and rigorous independent assessments against various environmental standards, including:**

- GHG Protocol Land Sector guidance,
- BSI Natural Capital Accounting standard BS 8632:2021
- ISO 14064:2
- ISO 14067

The PAS 2050 standard isn't assessed by third parties anymore. Claims based on self-assessment or old third-party evaluations can't be trusted for quality and compliance.

Different greenhouse gas accounting standards ensure that the accounting is scientific, accurate, consistent, and checked for quality. These standards cover important greenhouse gas sources and carbon sinks.

Not following the latest standards means not taking positive action.

The UK government wants to boost farming, help rural areas, and reach net zero emissions and environmental goals.


They've made it clear that these things are crucial.

At the same time, the supply chain asks for software that follows SBTi, including all essential emissions and removals.

Software that follows SBTi helps farmers and the whole industry find ways to cut emissions while keeping or raising production and improving nature.

Sandy doesn't only offer precise emissions accounting; it acts as a guide.

Sandy supports the economy and strengthens rural communities, which is vital for our food system.



*Defra critiques PAS 2050, urging alignment with modern carbon accounting standards.*

# Evidencing good practice

## Defra's findings

Most tools rely on users' honesty. This means there are no safeguards to prevent "gaming" the system. Users may feel tempted to manipulate the system.

When it comes to financial or policy incentives, some tools will struggle:

*'...there is a risk that where there are financial implications ... that the user could choose to misrepresent the system in order to improve their emissions results.'*

The report acknowledges that Calculator E is the only tool with built-in evidencing of good practices.

It also reported that some calculators took no steps to safeguard against such misuse and:

*'...would not be acceptable to carbon reporting standards such as ISO or GHG Protocol, since any misleading data would not fulfil their criteria of being Complete, Representative, and Accurate.'*

## Trinity's analysis

Sandy is the only tool with inbuilt functionality to evidence good practice.

Most calculators available in the space have overlooked this critical step towards standards compliance.

Following standards like ISO and GHG Protocol is important. It's a crucial step to access carbon markets.

**Sandy (calculator E) is the only one aligned with these required standards.**



**Sandy (calculator E) is the only one aligned with required standards.**

# Transition to net zero

Carbon calculators play a crucial role in achieving corporate, national, and international net zero targets.

This is achieved by providing baseline data and as decision-support tools for identifying mitigation opportunities and tracking progress in decarbonising the agricultural and food systems.

Defra cites benchmarking, supporting farmer decision-making, fungibility, economic incentives, and carbon removals as factors in supporting the move to net zero. (For carbon removals, see page 18).

## Benchmarking

### Defra's findings

A robust validation process is essential to ensure accurate data entry and true-to-practice results.

*'It is important in benchmarking that there is some understanding of the dataset that is being compared against.'*

*'Calculator E... provides...a 'Scientific Benchmarking' functionality, where users' results may be benchmarked against dynamic datasets designed to reflect the farm's own possible best practice.'*

### Trinity's analysis

While peer-to-peer benchmarking offers the potential to identify areas of improvement in farming practices, it is limited by issues related to:

- data consistency
- product-level benchmarking challenges
- the need for user training and support.

These limitations must be carefully considered when relying on peer-to-peer benchmarking as a decision-support tool in agriculture.

Benchmarking results using reference data, or scientific benchmarking, is generally preferred when high accuracy, objectivity, and comprehensive assessments are required.

Sandy provides scientific benchmarking. With this, users can compare their results to dynamic datasets that represent the best practices for their own farms.

## Economic incentives

### Defra's findings

*Carbon credits ... are growing in importance, and carbon calculators have a role to play in carbon and natural capital markets.'*

*'Should calculator providers wish to align their calculators with these markets, they may be required to follow standards...For example, BSI's BS 8632:2021 Natural Capital Accounting standard.'*

### Trinity's analysis

Sandy integrates various natural capital valuation standards and frameworks including BS 8632:2021, into a comprehensive, robust, and reliable solution, surpassing the limitations of individual standards.

This allows the creation of a risk register that consolidates complex data to identify natural capital risks and opportunities

# Transition to net zero

## Supporting farmer decision making

### Defra's findings

*'Some calculators are encompassing decision-support function, guiding farmers into actions that can support reduced emissions.'*

*'Calculator E provides an 'Optimisation journey' to enable identification of practices that can reduce emissions or increase removals; this also includes typical costs for actions enabling a cost-benefit assessment to be made by the user.'*

*'Calculator E also provides scenario planning within the carbon calculation module.'*

*'There is, however, a limit to what the calculators can do and these need to be complemented with expert advice (e.g. through effective knowledge exchange activities).'*

*'Calculator E provides free connection to a new generation digital engagement and collaboration platform for knowledge development, knowledge exchange, and upskilling.'*

### Trinity's analysis

Optimisation, scenario planning, and community engagement are essential for empowering farmers to:

- Make environmentally and economically sound decisions
- Adapt to changing circumstances

- Collectively work towards reducing emissions in agriculture.

Sandy by Trinity AgTech and our knowledge exchange community platform, Trinity Global Farm Pioneers, provide these requirements.

## Fungibility

### Defra's findings

*'a calculator's results are comparable, or 'fungible', enabling farmers to efficiently and rigorously evaluate land use options and farming practices, which is vital for an efficient and successful move towards Net Zero.'*

*'An added benefit of this is that it will enable fair flow of additional economic incentives provided by the nascent burgeoning carbon credit markets.'*

### Trinity's analysis

Harmonising carbon assessment methodologies across all farming sectors is crucial for the agricultural industry's successful transition, enabling efficient land use evaluation and alignment with emerging carbon credit markets.

This comparability of environmental assessments, supported by scientifically

backed software, also addresses the need for measurement alignment and fungibility in carbon credits, improving their tradability and market acceptance.

Overcoming these challenges is essential for the agricultural sector's sustainability and the growth of the carbon credit market.

# System boundaries

System boundaries in carbon footprints define the scope and limits of the assessment, specifying which emissions sources and processes are included and excluded from the calculation of a farm's greenhouse gas emissions.

Different boundaries can lead to significantly different results, so transparency and consistency in defining and reporting boundaries are crucial for meaningful carbon footprint assessments.

It's important to clearly define the system boundaries to ensure consistency and accuracy in carbon footprint calculations.

### Defra's findings

Calculators were found to vary in terms of prescriptiveness related to system boundaries:

*'The calculators apply a range of different system boundaries in the assessment of farm-level emissions.'*

They also differ in terms of the enterprises which can be covered.

Some are prescriptive on the system boundaries, while others allow the user to determine what to include.

The report recommended that calculators follow the system boundary standards laid out in the latest standards, report these clearly, and hence do not permit users to define system boundaries implicitly.

### Trinity's analysis

International standards like ISO 14064, ISO 14067, Greenhouse Gas Protocol, and SBTi need clear boundaries that include all important greenhouse gas sources and sinks. This is about following standards and being suitable for industry use.

Certain calculators are merely a collection of calculations rather than a cohesive tool. Users can pick what they want (even outside the scope) and leave out the rest. This can lead to misleading results that don't follow standards.

It doesn't meet policy or supply chain needs.

It could make people and organisations look like they're pretending to be more sustainable than they are, which may contribute to greenwashing.

Other tools limit their scope but don't provide Sandy's enterprise focus. This makes it hard to separate calculations from farm footprints.

Other tools can only meet the needs of some farms and businesses.

This alone precludes compliance for reporting under SBTi.

Sandy is unique in the comprehensiveness of its coverage, including:

- perennial
- anaerobic digestion
- soilless controlled environment
- certain livestock systems.

Clear boundaries are crucial to ensure the agricultural sector's success in transitioning to sustainability.

Farmers, businesses, and policymakers shouldn't have to set clear and consistent boundaries themselves.

A unified carbon assessment method applicable to all farming types is essential for efficiently evaluating land use and farming practices.

Comprehensive software using scientifically supported methods can ensure high-quality and comparable analyses across the entire agricultural sector.



# Data requirements

## Defra's findings

It was found that many calculators make assumptions to alleviate the burden of user data entry:

*'calculators... have to simplify data entry to a certain extent to enable the user to interact with the calculator and generate a useful result.'*

Oversimplifying a farm's data may mean calculators do not properly represent a farm or show farmers the true picture for improving practices, but it's not a simple win-lose situation:

*'Recent software developments within calculators can reduce the need for complexity and at the same time can deliver good user experience and accuracy.'*

It's important to gather more detailed data to understand emissions and how to reduce them better. Using tools like AI/ML for automated checks can help with data collection.

## Trinity's analysis

Sandy is unique because it lets farmers add as much detailed information as they want, even at the field level. It's the only tool that does this.

It's also unique because it uses helpful tools like artificial intelligence and machine learning to make things easier for users dealing with complex data.

Other tools only work at the farm or product level and are not as good at helping users provide data.

Sandy integrates a whole data system into sustainability reporting. This means that managing data becomes something valuable.

The benefit of this is making sure the farm's journey to net zero is well explained and easy to share with everyone involved.

It helps get support from the supply chain and makes sure the change is beneficial.



# Reporting

## Defra's findings

The report calls for clearer, agriculture-specific guidance on measurement and reporting of carbon removals.

The report calls for clearer, agriculture-specific guidance on measurement and reporting of carbon removals.

Calculator D mixes up emissions from making fertilisers (which farmers can't control) with

emissions from using fertilisers on the field (which farmers can control). It also calls emissions from handling manure "enteric" emissions.

## Trinity's analysis

Sandy follows ISO footprinting standards and SBTi.

These standards require clear labelling of where emissions come from and where carbon gets stored. This makes things clear and consistent.

This helps prevent claims of greenwashing, which can harm trust in the industry.

Meeting these standards should be the basic rule. It ensures that the reports are right, suitable, and detailed enough for intelligent decisions that help reach net zero while making more profit.

Farmers need to understand in-field emissions because they can control and improve them.

These numbers are usually linked to the cost of inputs and also to what the supply chain stakeholders care about in Scope 3.

So, it's important to show these numbers clearly to farmers. This helps them make intelligent choices in managing their farms.



# Soil carbon sequestration

## Defra's findings

Calculators are using a range of methodologies to account for soil carbon sequestration. Some do not include it at all.

It was noted that this is particularly relevant to achieving net zero aims:

*'For net zero calculations it is important that calculators are presenting carbon removals...'*

Where it was included, the report found inconsistencies and that:

*'...different approaches have been taken to provide a "number"'*

implying both a lack of consensus and a lack of rigour.

The report also noted that IPCC Tier 1 methodologies are commonly used, but

*'...this approach is not designed to assess sequestration at farm scale.'*

The report recommended that:

*'...calculators should include carbon stock changes using higher Tier (II or III) methods – aligning with latest guidance on this (e.g. SBTi and GHG Protocol LSR guidance).'*

In the case of calculator E, it was identified that the tool:

*'...uses the IPCC Tier II guidance and a bespoke modelling approach ... [giving a] clearer understanding of changes in soil carbon.'*

## Trinity's analysis

Sandy stands out because it uses a Tier 2/3 method.

Defra has judged all other calculators as not good enough in this area.

Excluding soil carbon is inexcusable and places the farmer at a distinct disadvantage.

Using a Tier 1 method is inappropriate at the farm level, and the report has identified it as such.

Many first-generation calculators want to switch to the newer IPCC (2019) Tier 1 methods. This matters for the farm's profits.

The calculations must be accurate and follow standards when carbon removals are used for payments, credits, or provenance audits.



# Peat soils

## Defra's findings

A key conclusion of the report is that accurate modelling of peat soils is a minimum requirement.

Many calculators excluded peat altogether, while others included it only as a single emission factor.

Calculator E is the only tool that includes peat beyond a single emission factor.

It was also found that emissions from peat soil can greatly impact the footprint, outweighing all other sources.

*'The approach to carbon stock changes was highly variable between calculators, causing further increases in divergence in the net emissions between the calculators. This was particularly so for ... lowland peat soil, as not all calculators captured emissions from cultivated peat.'*

## Trinity's analysis

Sandy stands out from other calculators in the report. It includes peat soils in a practical way. The main authors of the IPCC Wetland Supplement created Sandy's method.

No other tool includes a scientifically robust peatland module.

Methane and carbon dioxide emissions from farmed peat can be much higher than other farming sources for each piece of land. So, leaving it out or not paying attention to it is unacceptable.

Mitigation methods for peat soils differ from those for mineral soils. They mainly focus on managing the water table and safeguarding the soil. **Sandy is the only calculator to offer these options.**

The report demonstrates that the sector is increasingly aware of peat soils' emissions and mitigation potential. Ignoring this in carbon accounting will no longer be acceptable.

The significant potential for reducing emissions from peat soils may lead to industry and policy support and incentives. The calculations must be accurate and follow standards when carbon removals are used for payments, credits, or provenance audits.

*Sandy is unique in its inclusion of a scientifically robust peatland module, recognising the significant emissions and mitigation potential of peat soils.*

# Woodland sequestration models

## Defra's findings

Defra identifies the Woodland Carbon Code (WCC) as an appropriate and standards-compliant methodology for calculating woodland sequestration.

*'The Woodland Carbon Code ... is designed to be robust enough to create carbon credits.'*

The report also criticises the use of more generic IPCC Tier 1 methodologies in this space:

*'The use of IPCC [Tier 1] approaches means that the analyses ... may not reflect actual rates of growth in UK woodlands and lack much granularity.'*

Finally, Defra found that the yield class calculation of the WCC method could be challenging for non-expert users.

**Calculator E was the only one that solved this problem.**

## Trinity's analysis

Defra noted that Sandy stands out using the WCC and Tier 3 methods to help users with yield class calculations.

Competitor tools rely on users to calculate yield classes or use IPCC Tier 1.

Methods requiring much user knowledge and calculations won't meet compliance standards.

Tier 1 methods might not be accurate enough for third-party acceptance.

Woodland sequestration will be necessary for generating carbon credits and insets on farms. Alongside soil carbon sequestration, this is a primary source of removals in agriculture.

Farm-level footprinting tools must follow standards and meet industry needs, benefiting farmers and the supply chain.



# Methods for direct livestock emissions

## Defra's findings

Calculators use various methods for direct livestock emissions, but most use some version of the IPCC Tier 2 approach.

Defra also found that for accurate mitigation analysis, it's important for calculators to connect livestock diets with enteric and manure emissions. However, many calculators do not do this.

*'From the scenario analysis, it appears that although all the calculators are all using the Tier II approach, the assumptions they are using to support it are different, and their responsiveness to user data entry differs.'*

It was noted that a more granular approach is necessary for mitigation analysis:

*'...for mitigation, having increased granularity of data entry and responsiveness to that data entry will enable users to investigate how dietary change might impact on enteric emissions.'*

## Trinity's analysis

Sandy is the only tool that links livestock rations to enteric and manure nitrogen.

Several tools claim to do this and say they use Tier 2 but don't connect rations to emissions.

Defra says that this "halfway" approach might confuse users.

Sandy is also unique because it uses diet-linked FAO-derived Tier 3 elements to fill gaps in the IPCC methods for monogastrics.

This means Sandy is the only tool to record best practices and ways to reduce emissions connected to livestock diets and manage enteric methane.

Methane from ruminant animals is a big part of farm emissions. That's why both policies and the industry must work on reducing these emissions.

Farmers need a tool that keeps track of emissions and the right practices for managing enteric methane according to set standards to get new rewards or support.

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*Sandy uniquely links enteric and manure nitrogen to livestock rations, setting it apart from other tools. This capability allows Sandy to capture good practices and mitigation related to enteric methane management, essential for addressing agricultural emissions and accessing emerging incentives in this field.*

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# Nitrous oxide methodologies

## Defra's findings

Calculators use a mix of methods for nitrous oxide calculations.

Some calculators have adopted the UK Tier 2 approach, while others use the disaggregated IPCC Tier 1 approach.

The report pointed out that the UK Tier 2 approach is regional, while the IPCC Tier 1 approach is international, with implications for their respective geographical applicability.

The report did not identify evidence to the effect that the Tier 2 approach is more accurate.

Defra recommends adopting a Tier 3 approach when feasible. Generally, more detailed approaches lead to more specific and useful emission reduction suggestions in the results.

*'...specifically relevant ... to the user's location [and the greater the opportunity for] more specific mitigation activities to be represented within the results.'*

## Trinity's analysis

Defra acknowledges that Sandy uses the disaggregated 2019 Tier 1 approach. This means Sandy follows the right standards, has the latest methods, and works worldwide.

This is critical for SBTi compliance and proper supply chain accounting.

Others using the UK Tier 2 approach might say it's better because it has a higher Tier number, but no strong evidence supports this claim.

You cannot use it for international reporting, either.

Sandy is unique in that it has a Tier 3 method in development; the report acknowledges this.

Sandy provides worldwide, region-specific nitrous oxide calculations with detailed data for mitigation.

Nitrous oxide is the top emissions category in arable and horticulture systems. It's also important in livestock and mixed farms. Production practices and crop yields are closely linked to this gas.

A tool that can understand the details of good nitrous oxide practices is crucial.

It helps the sector move towards net zero and gets support from industry and policies for good practices on farms.

**Sandy's Tier 1 method aligns with standards, Tier 3 enhances accuracy.**

# Global methodologies

## Defra's findings

Some calculators are only appropriate for use in the United Kingdom, while others are suitable for global use.

The report highlighted that using UK-only calculators in regions outside their intended use will likely lead to inaccuracies.

## Trinity's analysis

Sandy is not unique in being globally aligned. However, some calculators cannot claim to be globally aligned.

This is important because the UK imports over 50% of its food, while exports contribute to the UK economy.

Using regional methods to calculate greenhouse gas emissions won't work for supply chains or when reporting to SBTi. They need everyone to use the same way of calculating emissions for all types of products.

# Standardised emission factors

## Defra's findings

Certain datasets have emerged which have become industry-standard for carbon calculations.

The report identified the Global Feed LCA Initiative (GFLI) feed data, Fertilizers Europe, and the UK Govt Conversion Factors as three such datasets.

Despite the availability of these data sources, not all calculators have been updated to include them:

*'...not all the calculators used these data sources, and where this was the case, this resulted in some large differences in emissions between calculators.'*

## Trinity's analysis

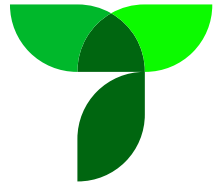
GFLI, for example, uses industry and public input and data to fix problems with old and different estimates about feed emissions.

These issues made it hard to trust the carbon footprint numbers for Scope 3, making people think there was greenwashing and confusion.

However, data like GFLI allows benchmarking and creates industry agreement.

Sandy uses all the datasets reported by Defra, and Trinity has been part of GFLI for years.

Unlike competitors, Sandy automatically gives farmers regular and current results. This helps supply chains trust the data, simplifies checking where things come from, and makes SBTi reporting easier to accept.



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