Carbon Calculator Review

January 2020

In 2019, the NFU set the goal of reaching net zero greenhouse gas (GHG) emissions across the whole of agriculture in England and Wales by 2040. This is agriculture's contribution to the UK's ambition of achieving net zero by 2050. Conducting farm-level audits through a carbon calculator can be helpful for GHG mitigation. The NFU recognises that a review of the carbon calculators currently on the market is required.

There are two ways of estimating a greenhouse gas footprint ('carbon footprint') for agricultural production and associated NFU policy work:

(1) The footprint of the entire farm business. This can be useful to identify the major sources of greenhouse gas emissions, as well as sinks in the form of on-farm carbon storage, the use/generation of renewables and/or other bio-economy products. A whole-farm carbon footprint may highlight areas for improvement, and can be used again later to assess progress if farm practices are changed.

(2) The footprint of the major food commodity being produced, in emissions per unit of production. This enables 'benchmarking' within supply chains and against national or international comparators. Again, it may highlight major factors contributing to the footprint and potential improvements that could be made.

There are 64 potentially applicable tools[1]; however this NFU review evaluates three carbon calculators most applicable to our members, focusing on usability, coverage, scientific robustness and practicality. None of the carbon calculators reviewed cover all the needs of the NFU.

Cool farm Tool **Farm Carbon Calculator** **AgRE Calc**

[1] Leinonen, Ilkka & Eory, Vera & Macleod, Michael & Sykes, Alasdair & Glenk, Klaus & Rees, Bob. (2019). Comparative analysis of farm-based carbon audits.

Cool Farm Tool

The Cool Farm Tool is free for famers with five product footprints available before a fee is required. Organisations that use the CFT to support sustainable agriculture (a wide range of food supply chain participants) pay to become members of the 'Cool Farm Alliance'. Its web site suggests 'it takes 10-15 minutes to get a rough estimate of your carbon footprint by entering information off the top of your head'. To refine this estimate using information from farm records is likely to take much longer.

Name	Cool Farm Tool
Product or whole farm?	Product
Who developed it and who owns it?	Originating from work undertaken by the Sustainable Food Lab, Unilever, and the University of Aberdeen, it was designed and developed by the Antithesis Group. Managed by the Cool Farm Alliance.
What production systems does it cover?	Covers all main UK agricultural production systems
Data requirements	Crop data • Harvested yield and marketable yield product weights • Growing area • Fertiliser applications: type and rate • Number of pesticide applications • Energy use (kWh and fuel use) • Optional: transport: mode, weight of product and distance Livestock data • Herd or flock size • Feed • Manure management • Energy use (kWh and fuel use) • Transport of feed and other inputs Dairy data • Total milk production, fat content, protein content • Grazing • Feed • Manure management • Energy use (kWh and fuel use) • Transport of feed and other inputs
Results	Informs farm management options, environmental performance, and allows farmers to track and measure improvements over time

Advantages

- Free to use (registration needed)
- Good instructions for data input
- Account for emissions from land use change e.g. the production of soya bean meal from deforested land overseas
- Allows users to calculate the carbon footprint of home grown feed through the crop module
- Footprints also available for biodiversity and water use
- Measures improvements over time
- Data aggregation is available- however this is a paid, member only feature

Disadvantages

- Provides product-specific results only, rather than a whole farm assessment making audits for mixed farming enterprises challenging
- Carbon sequestration does not feature heavily in the tool therefore a focus is placed on emission sources rather than sinks
- Applies simplistic outputs for livestock other than cattle; therefore animal performance is largely based upon default values
- Does not consider embedded emissions from livestock bought in i.e. only the animals that are held on the farm being audited are considered, not animals of the breeding herd (suckler cows, breeding birds, sows), unless these animals are kept on the same farm as the meat animals
- Does not adequately account for productivity improvements (such as mortality rate or health) and the resulting impact upon GHG emissions

Farm Carbon Calculator

Developed by the Farm Carbon Cutting Toolkit organisation, the Farm Carbon Calculator (version 5, 2020) is free to use (requiring registration and creation of a login). Version 5 includes updates to many GHG emissions and sequestration factors.

Documentation available on the website explains the updates. This tool includes carbon storage and provides a whole farm carbon footprint showing the farm carbon balance (sources and sinks).

Name	Farm Carbon Calculator
Product or whole farm?	Whole farm
Who developed it and who owns it?	Developed and run by farmers Funded by the Esmée Fairbairn Foundation and crowdfunding
What production systems does it cover?	All main UK agricultural systems
Data requirements	There are 9 stages of data entry (see below). Data entry is for your farm business over the last 12 months. • Fuel • Materials • Inventory • Crops • Inputs • Livestock • Waste • Distribution • Sequestration
Results	Summary of GHG emissions, sequestration and farm total carbon balance

Advantages

- Free tool and easy to use with no restrictions of use (registration needed)
- Excel spreadsheet provided to collect the data
- Lives results are shown in the data entry phase allowing it to be used as a decision making tool
- Unlimited carbon reports can be completed
- Includes carbon sequestration in the model and a farm carbon balance is provided
- Results can be downloaded as a PDF or shared with another user though the carbon reports page
- Major land use change included e.g. woodland to arable
- Website has case studies and a separate 'farm GHG' section providing advice on how to reduce your carbon footprint

Disadvantages

- Reports completed using the previous version four cannot be transferred to the new version five model. Reports can be accessed but data does not automatically transfer to the new model
- Productivity measures for livestock (mortality, fertility etc.) are not accounted for in the model
- Does not consider embedded emissions from livestock bought in i.e. only the animals that are held on the farmbeing audited are considered, not animals of the breeding herd (suckler cows, breeding birds, sows), unless these animals are kept on the same farm as the meat animals
- The tool is not fully transparent concerning its data sources
- Assessments can be repeated but these do not offer a direct comparison between years
- Benchmarking- as yet you cannot compare your data to 'average' figures across different farms

AgRE Calc

SAC Consulting has developed this agricultural resource efficiency calculator that determines on-farm emissions down to enterprise and per unit of output basis; according to their documentation, 'the most meaningful comparisons when considering food production'. By breaking down emissions and resource use by enterprise, AgRE Calc identifies weaknesses and highlights actions to improve performance.

Name	AgRE Calc
Product or whole farm?	Whole farm, individual farm enterprise and products
Who developed it and who owns it?	Owned and developed by SAC Commercial Ltd, the commercial holding company of SRUC. Free at present. SRUC provide Scottish farmers free access to the tool but reserve the right to agree charges for other users in the future
What production systems does it cover?	Main cereals, oil crops, legumes, potatoes, other root vegetables, other vegetables, fruits, berries Beef, dairy, sheep, pigs, poultry (laying hens, broilers, turkeys, ducks)
Data requirements	There are three main data entry sections: • Land and crops- inorganic and imported organic manure, crop residues, embedded emissions associated with purchased inorganic fertiliser, lime and pesticides • Livestock- storage and application of organic manure, ruminant enteric fermentation, manure management and embedded emissions associated with purchased feed and bedding • Energy and waste- energy use and disposal of waste
Results	Total farm GHG emissions and breakdown according to crop and livestock species and type of GHG

Advantages

- Freely available (requires registration)
- Web based version is easy to use (excel version also available)
- Calculates whole farm emissions, emissions by enterprise and on a product basis
- Captures forestry carbon sequestration and renewable energy production
- The output reports are easily accessible
- Tool is designed for repeated assessments

Disadvantages

- Does not include emissions from land use change
- Livestock modules are currently under further development but this version is not live yet
- Soil carbon sequestration is not accounted for
- AgRE Calc does not consider embedded emissions from livestock bought in i.e. only the animals that are held on the farm being audited are considered, not animals of the breeding herd (suckler cows, breeding birds, sows), unless these animals are kept on the same farm as the meat animals.
- The type and age of the forest has no effect on the carbon sequestration calculations
- Tool does not provide a comprehensive way of assessing potential carbon sequestration through crop management

Conclusion

None of the carbon calculators reviewed cover all the needs of the NFU. It is important to recognise the different scales in which the tools operate: Cool Farm Tool focuses on one product e.g. winter wheat, whereas Farm Carbon Calculator and AgRE Calc consider the carbon footprint of the whole farm.

The result of any farm carbon calculator should not be the sole information source for decision making as it is important to consider areas that are not represented in the tool. A farm carbon footprint should be completed as accurately as possible and the output interpreted while considering the wider environmental and farm context.

Cool farm Tool **Farm Carbon Calculator** **AgRE Calc**