

# Resource Use Efficiency on Arable Farms

## Practical Guide

Making more efficient use of resources i.e. inputs, strongly correlates with **reduced production costs per kg of grain**, improving profitability for the farm business. Resource use efficiency can be measured by a process known as carbon footprinting.



By identifying the quantity of greenhouse gas emissions produced on farm, carbon footprinting highlights areas where changes can be made that, when implemented, will reduce emissions.

Carbon footprinting should be seen as a way to improve on-farm resource use efficiency, whilst also delivering environmental benefits.

This Practical Guide concentrates on some of the opportunities that could come from carrying out a carbon footprint on an arable farm.

### The key GHG emissions and where do they come from?

Arable farms emit carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O). CO<sub>2</sub> is released by burning fossil fuels and during changes in land use, and N<sub>2</sub>O is released from soils following the application of nitrogen fertiliser (manufactured and organic) and soil disturbance.

### How is a carbon footprint calculated?

Using relevant tools, farm specific data such as area of crops grown along with fertiliser, lime, pesticide, fuel and electricity use is converted into greenhouse gases. The emissions are then expressed as **carbon dioxide equivalents (CO<sub>2</sub>e)** on a 'per net unit of food product leaving the farm' basis. For an arable farm this would be kg CO<sub>2</sub>e per kg of grain sold.

### Why should I have a farm carbon footprint?

A carbon footprint allows the performance of your farm to be benchmarked against other similar enterprise types, highlighting scope to implement efficiency savings and save money.

Many supermarkets and processors already require farm businesses to prepare carbon footprints. Some even offer a premium or better contract terms to farms that can demonstrate they are efficient and sustainable.



There are five sets of Practical Guides covering :

Use energy and fuels efficiently

Develop renewable energy

Lock carbon into soils and vegetation

Optimise the application of fertilisers and manures

Optimise livestock management and the storage of manure and slurry

Find further information, including links to other Practical Guides and Case Studies, at

[www.farmingforabetterclimate.org](http://www.farmingforabetterclimate.org)



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## Websites

[www.farmingforabetterclimate.org](http://www.farmingforabetterclimate.org)

[www.sac.ac.uk/climatechange](http://www.sac.ac.uk/climatechange)

[www.farmingfutures.org.uk](http://www.farmingfutures.org.uk)

[www.bbc.co.uk/climate](http://www.bbc.co.uk/climate)

[www.scotland.gov.uk](http://www.scotland.gov.uk)

[www.ipcc.ch](http://www.ipcc.ch)

[www.sac.ac.uk/climatechange/carbonemissions](http://www.sac.ac.uk/climatechange/carbonemissions)

[www.calm.cla.org.uk](http://www.calm.cla.org.uk)

[www2.cplan.org.uk](http://www2.cplan.org.uk)

[www.planet4farmers.co.uk](http://www.planet4farmers.co.uk)

[www.fertbench.com](http://www.fertbench.com)

[www.agrecalc.com](http://www.agrecalc.com)



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## How do you improve efficiency on an arable farm?

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The key measures of a farm's performance with regards to greenhouse gas minimisation are broadly similar to performance indicators currently used by the industry (see box). **Improvement in productive efficiency** is the most important factor that you have within your control to reduce emissions and **positively steer profit**. The following three example efficiency measures are based on actual farm data and are indicative of what could be achieved. They also illustrate that greenhouse gas emission reductions are compatible with maximising farm profits.

### Example efficiency measure 1 – Increase crop yields

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Ensuring crops are healthy will mean that they will use inputs more efficiently, resulting in higher yields and a lower carbon footprint. This can be achieved through good crop husbandry practices such as applying agrichemicals at optimum rates and timing, reducing soil compaction, improving land drainage and selecting high yielding varieties that are suitable to the local conditions.

Using data from an arable farm it was shown that increasing crop yields by 0.4t/ha (5%) could increase crop sales and reduce emissions by 6% per kg grain sold.

### Example efficiency measure 2 – Improve nitrogen use

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Targeted applications and optimisation of nitrogen inputs can help to reduce GHG emissions from nitrogen fertiliser and soils and indirect emissions from fertiliser manufacture. This can be achieved by applying inorganic and organic manure according to analysis, nutrient budgeting to meet crop requirements and application when the crop is able to make efficient use of the nutrients i.e. it is growing. Maintaining and checking calibration of fertiliser and manure spreaders and using precision farming technology can also help to improve nutrient use on the farm.

Nutrient budgeting and making better use of organic manure, the arable Climate Change Focus Farm reduced bagged nitrogen use by 3,428 kg (8%) costing £3,120 without compromising crop yield, reducing their carbon footprint by 11% per kg grain sold.

### Example efficiency measure 3 – Improve fuel use

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Precision farming technology, matching tractors and machines to field operations, planning work to minimise journeys, regular machinery maintenance and ensuring the correct tyre pressure is used are just some of the ways to improve machinery and equipment efficiency. Using machinery efficiently has the potential to reduce fuel use between 10% and 20%.

On an arable farm using on average 105 litres of red diesel per hectare, a 10% reduction in red diesel use reduced the farm carbon footprint by 2% per kg grain sold and saved £2,500 on the fuel bill.

## Next steps?

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Undertaking a farm carbon footprint will help you to establish an action plan to improve business resource efficiencies and assess year on year change. Regular assessment can help quantify progress and positively direct efforts to make the most of inputs whilst reducing farm greenhouse gas losses. An action plan based on technical performance targets should aim to take one step at a time towards a more efficient, lower cost system with a reduced carbon footprint.

### Key Performance Indicators

- ✓ Crop yields
- ✓ Crop quality
- ✓ Crop moisture content
- ✓ Total nitrogen applied
- ✓ Total fuel used
- ✓ Grain drying
- ✓ Pesticide use