UK FLOUR MILLERS

Members only

UK FLOUR MILLERS BRIEFING DOCUMENT

The Carbon Footprint of Flour

Revised July 2017

Summary

"Carbon footprinting" is an important measure in both production and service sectors. The Carbon Trust defines a carbon footprint as "the total set of greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organisation, event or product".

Flour milling has its own carbon footprint that is closely linked to agricultural production. There is a degree of confusion surrounding carbon footprint assessments and therefore a clear need for the sector to understand some of the background and the key issues surrounding calculating a carbon footprint for an individual flour product. This briefing aims to provide millers with information that will allow them to better understand these key issues.

Background

The most important GHGs, those covered by the Kyoto Protocol, are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Each GHG has a different capacity to cause global warming; this is defined by its 'Global Warming Potential' (GWP). The Intergovernmental Panel on Climate Change (IPCC) uses GWPs to measure how much of a given mass of a GHG is estimated to contribute to global warming. A GWP is defined as the warming influence over a set period of time of a gas relative to that of carbon dioxide. The figure is then given as the total carbon dioxide equivalent, or CO_2e.

Flour milling is the manufacturing stage, with wheat being the source ingredient. Flour would be classed as a 'Business-to-Business' (B2B) product, rather than a 'Business-to-Consumer' product (B2C), as it is mainly manufactured for use in secondary products. Therefore, to consider the carbon footprint of flour production all stages up to the secondary producer must be considered.

According to the UK GHG Inventory (2014), the largest source of emissions in the UK is the energy sector (35%), followed by transport (20%) and business (15%). Agriculture in the UK accounts for 10% of total emissions. Since 1990, emissions from the UK agricultural sector have decreased by 20%, driven mostly by a decrease in emissions from agricultural soils. Agricultural soil emissions arise from the use of fertilisers (synthetic and animal manures), biological fixation of nitrogen by crops, ploughing in of crop residues, cultivation of organic soils, indirect emissions from atmospheric deposition of nitrogen oxides and ammonia, and leaching and run-off of nitrate. Nitrous oxide is the dominant GHG, accounting for 53% of emissions from this sector.

Calculating the carbon footprint of products is a complicated process that requires a very detailed approach. It is therefore advisable for businesses to seek specialist advice, since it is important to use a consistent methodology to ensure an accurate, credible result that can be compared with other organisations or products. There are existing, recognised methods for carbon footprint calculation that are widely accepted and understood.

PAS 2050 and the Carbon label

The British Standards Institution (BSI) has developed an internationally applicable Publicly Available Specification (PAS) for a method of measuring the GHG emissions from goods and services.

The development of PAS 2050 commenced in June 2007 and was launched in October 2008. The latest revision (2011) is available to download from the BSI website (http://shop.bsigroup.com/en/forms/PASs/PAS-2050/).

In Appendix III of the Carbon Trust's 'Guide to PAS 2050' there is a worked example of the calculation of the carbon footprint of croissant production, which may be a useful example for millers and bakers.

In March 2007, the UK 'Carbon Label' was introduced by the Carbon Trust. The label complies with the British Standard PAS 2050 and is displayed on packaging publicising the carbon footprint of a product. The label helps businesses to measure, certify, reduce and communicate the GHG emissions of their products. Use of the label encompasses a reduction element, where the company commits to a reduction of their carbon footprint over two years. Failure to do so results in the loss of use of the label.

Life Cycle Assessment

The initial step when working out the carbon footprint of any product is to assess its full life cycle. The European Commission defines Life Cycle Assessment (LCA) as 'all the production processes and services associated with the product through its life cycle, from the extraction of raw materials through production of the materials which are used in the manufacture of the product, over the use of the product, to its recycling and/or ultimate disposal of some of its constituents'.

Life Cycle Assessment (LCA) datasets are available on the European Commission website, on the 'Life Cycle Assessment Tools, Services and Data' pages.

As flour is a B2B product its carbon footprint ends when it is delivered to another manufacturer.

Wheat production

Wheat is the key ingredient for flour milling. There are many individual wheat production systems in the UK and therefore the carbon footprint for each will be different. Feed wheat tends to require lower inputs than bread-making wheat and organic less again.

The AHDB has developed a "Carbon footprinting decision support tool" which can be used in conjunction with AHDB's "Understanding carbon footprinting for cereals and oilseeds" publication to calculate the carbon footprint of wheat and other crops.

There are a number of factors that must be taken into account when calculating the carbon footprint of wheat production. These include:

- Yield
- Soil type
- Fertiliser manufacture
- Fertiliser-induced field emissions
- Pesticides
- Crop residue management
- Field energy use (cultivations etc.)
- Grain drying
- Transport

It is estimated that fertiliser nitrogen accounts for 70% of the total GHG emissions associated with wheat production. Nitrous oxide is emitted as a by-product of the nitrogen cycle in soil when nitrogen is transferred between organic matter, ammonia and nitrate.

Milling

The CO_2e of the milling process can be calculated using the following equation. In order to do this, information must be obtained from the electricity supplier for the CO_2e value for 1kWh electricity used, total electricity usage per site per year in kWh and the number of tonnes of flour milled in the same year at each site.

$$\frac{CO_2e \text{ of } 1kWh \text{ electricity x total electricity usage per year}}{\text{Total flour production in tonnes}} = CO_2e \text{ of } 1 \text{ tonne of flour}$$

Flour Distribution

Approximately 70% of flour produced in the UK is distributed unpackaged via bulk tankers. The remainder is packaged either in sacks or in smaller bags and distributed, palleted, in lorries. Whether the vehicle is filled to capacity and whether it returns empty or carries another load must be taken into account when calculating the footprint. Vehicle efficiency is also key.

Packaging

In order to calculate the total kg CO_2e, a measure of the packaging required for each functional unit of flour is required. This may be obtained from the packaging supplier who may already have calculated the carbon footprint of their products.

Future work

UK Flour Millers will continue to monitor work in this area and to brief members