



Dolphinston Farm, Jedburgh, TD8 6LR

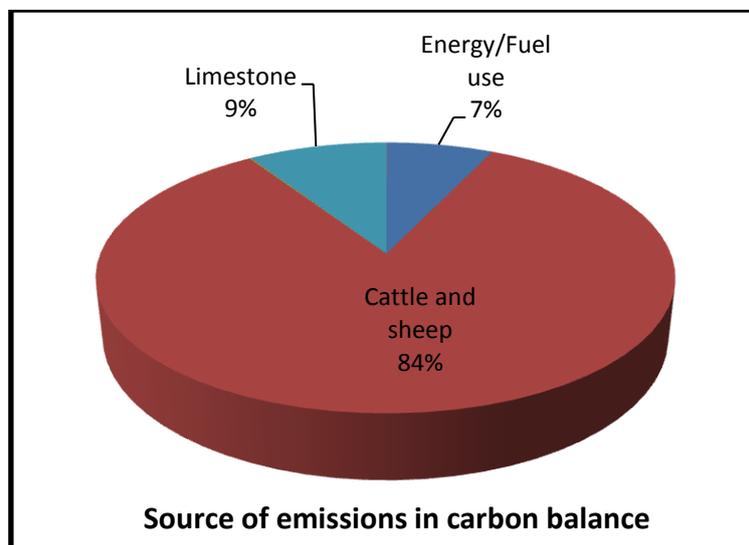
Introduction

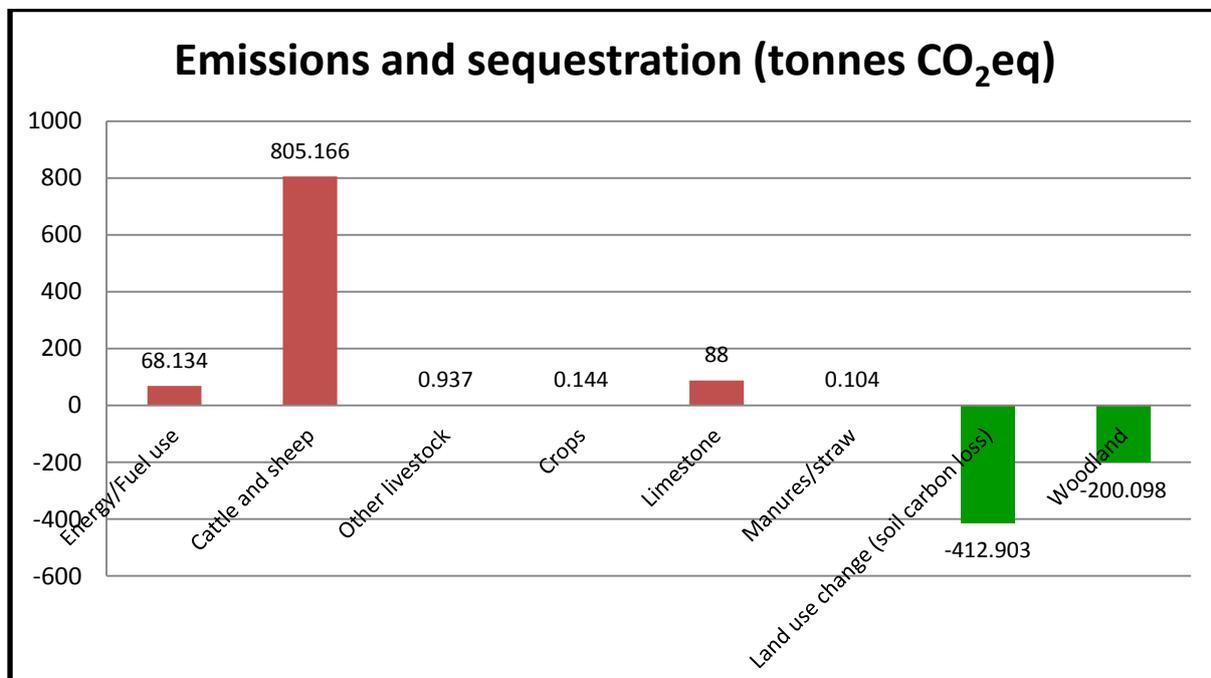
Dolphinston Farm is a 580 hectare organic beef and sheep farm near Jedburgh, Scotland. The farm has 1600 Lleyln and Greyface ewes with 600 ewe hogs and 60 rams; and 100 Shorthorn and Angus suckler cows and 20 breeding heifers in two herds to maintain pure breeding. The farm is entirely down to grass, with approximately 200 ha of permanent pasture, 200 ha of temporary grassland including some red clover silage fields and 100 ha of rough grazing. No arable cropping is carried out.

Carbon footprint

The carbon footprint for Dolphinston Farm has been carried out using the CALM calculator which is available to use for free at www.calm.org.uk. The calculator enables farmers to assess the carbon balance of their farm. It produces a 'whole farm' report which indicates the level and type of emissions attributable to different areas of the farm system enabling the user to identify 'hotspot' areas where improvement could be made and quantify the affect that such changes could have on the farm's carbon footprint.

Source	CO ₂ (kg)	CH ₄ (kg)	N ₂ O (kg)	Total CO ₂ eq (tonnes)
Energy/Fuel use	68,134.0			68.13
Cattle and sheep		36,177.0	146.6	805.17
Other livestock		39.0	0.4	0.94
Crops			0.5	0.14
Limestone	88,000.0			88.00
Manures			0.3	0.10
Land use change (soil carbon loss)	-412,903.0			-412.90
Woodland	-200,098.0			-200.10
TOTAL	-456,867.0	36,216.0	147.8	349.48
Emissions per hectare				0.60 (600kg CO₂eq/ha)
Emissions per kg of output from the farm				0.004 (4kg CO₂ eq/kg LW)



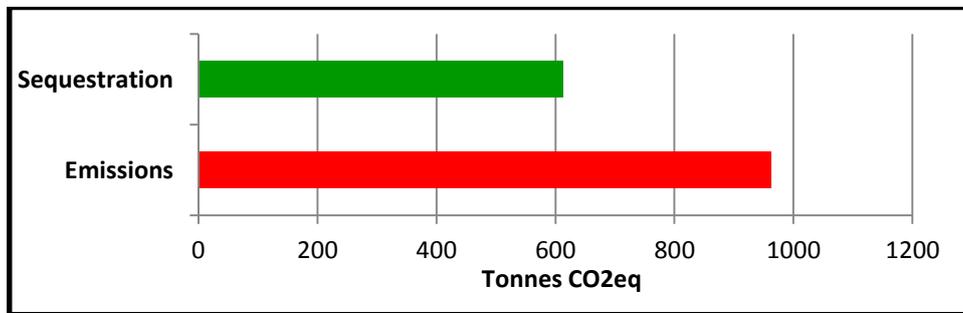


Dolphinston Farm's overall carbon footprint for the last 12 months is 349.48 tonnes CO₂eq. This equates to 600kg CO₂eq per hectare or 4kg CO₂eq per kilo of livestock sold (LW). This figure is below average as the farm uses no fertilisers or chemicals and no feed is imported. The reversion of some arable land to pasture and the woodland on the farm also helps reduce the farm's emissions by removing CO₂ from the atmosphere and sequestering carbon in vegetation, biomass and the soil.

The majority of emissions in the farm's footprint come from the sheep and cattle. These emissions are predominantly methane from enteric fermentation as well as some nitrous oxide and methane released from manures. Methane is produced as part of a natural and vital process and can therefore not be eliminated. Improved production efficiency can minimise these emissions to a certain extent – EBLEX, the UK's national beef and sheep levy board suggest that achieving optimum daily liveweight gains; achieving best finishing weights as early as possible; feeding a high quality diet; and ensuring a high output per breeding unit will all contribute to creating a low carbon system. In their most recent carbon report 'Down to Earth', they report a positive correlation between gross margin per kg liveweight and carbon emissions – for every 5kg of CO₂ eq reduction they found a 50p per kg increase in margin. Improving efficiency through increased fertility, feed efficiency, and longevity could all contribute to improving emissions while also improving profit margins. The latest EBLEX report can be found at <http://www.eblex.org.uk/publications/corporate.aspx>.

The negative contribution to emissions arising from the use of limestone while making up 7% of the footprint balance is outweighed by the positive effect that the limestone will be having on soil properties. Maintaining an optimal soil pH helps minimise N₂O emissions from the soil – if lime was not applied and the pH was to fall the rate of emissions from soil processes such as would increase. A soil' pH affects the rate of nitrification and denitrification within the soil which both release N₂O. Optimising pH contributes to stabilising these processes and therefore minimising the emission of N₂O.

A comparison of emissions against carbon sequestered in woodland and through land use change shows that for every tonnes of emissions (CO₂ eq) the farm sequesters (stores) 0.64 tonnes of carbon in its woodland and the soil which has been reverted from arable to grassland/woodland. This level of sequestration is thought to continue for 20 years after the change occurs before reaching a balanced state.



One aspect of the farm's carbon balance not taken into consideration by this footprinting exercise is the amount of carbon sequestered in the soil under grassland. Carbon is emitted when grassland is ploughed up – the figure shown in the table for 'crops' represents carbon lost through ploughing up temporary leys (0.144 tonnes CO₂eq) in the 12 month period examined. This footprinting calculation does not take into consideration the amount of carbon held by the soil and the longterm potential the soil holds in terms of removing carbon from the atmosphere. Soils under permanent pasture in Scotland are thought to contain an average of 843 tonnes CO₂eq per hectare in the top 1m of soil. Soils under arable or rotational (temporary) grassland contain significantly less with an average of 550 tonnes CO₂eq per hectare in the top 1m of soil. This is because the routine disturbance of the soil within a rotational or arable system interrupts soil processes and increases the level of microbial activity and therefore CO₂ released by the soil – this all results in carbon being lost to the atmosphere.

Based on figures published by the Forestry Commission in the Carbon Code, the temporary grassland at Dolphinston Farm holds approximately 110,000 tonnes CO₂eq. If this pasture was to be converted to permanent pasture and productivity maintained through overseeding instead of ploughing and re-seeding the carbon levels in the soil would increase significantly to approximately 168,600 tonnes CO₂eq – an increase of 58,600 tonnes CO₂eq, approximately 167 times the farm's annual emissions output (350 tonnes CO₂eq x 167 = 58,600 tonnes CO₂eq approx). (All figures taken from the 'Woodland Carbon Code' published by the Forestry Commission – <http://www.forestry.gov.uk/carboncode>.)