



## Pitgaveny Farms, Elgin, Moray, Scotland

### Introduction

Pitgaveny Estate comprises approximately 2000ha of lowland Moray between Elgin and Lossiemouth. Of this 1215ha is arable (925ha in hand), 480ha forestry mainly dedicated conifers and 320ha rough grazing, unplanted scrub, Spynie Loch and Marsh, gravel quarry etc. The estate is spread over 3 or 4 miles, amalgamating 10 units of various sizes. The farms have 925ha of mixed arable, vegetables, potatoes, cereals, beef and sheep including 140ha of rough grazing and improved grazing. The soil is mainly light sandy loam freely draining. The highest point is 30m above sea level and the lowest roughly at sea level, requiring drainage to be pumped. The Estate has two SSSI's – Loch Spynie and Spynie Quarry, various conservation schemes (79ha) and woodland schemes (23ha).

### Organic production

Organic conversion started in 1999 and at present 318ha is fully organic. Crops grown organically are grass, oats, barley, wheat, beans, potatoes, carrots and parsnips. The estate has 450 organic English Mule ewes which are put to Suffolk, Texel, Meat Link & Lleyt tups with fat lambs then sold from June to August. Ewe lamb replacements are bought in annually. The organic herd comprises of 25 converted cows (heifers from own conventional herd) which are put to an Aberdeen Angus bull. Heifer calves are currently kept as the farm is in the process of increasing the herd size. All other off spring are finished and sold fat.

### Non organic production

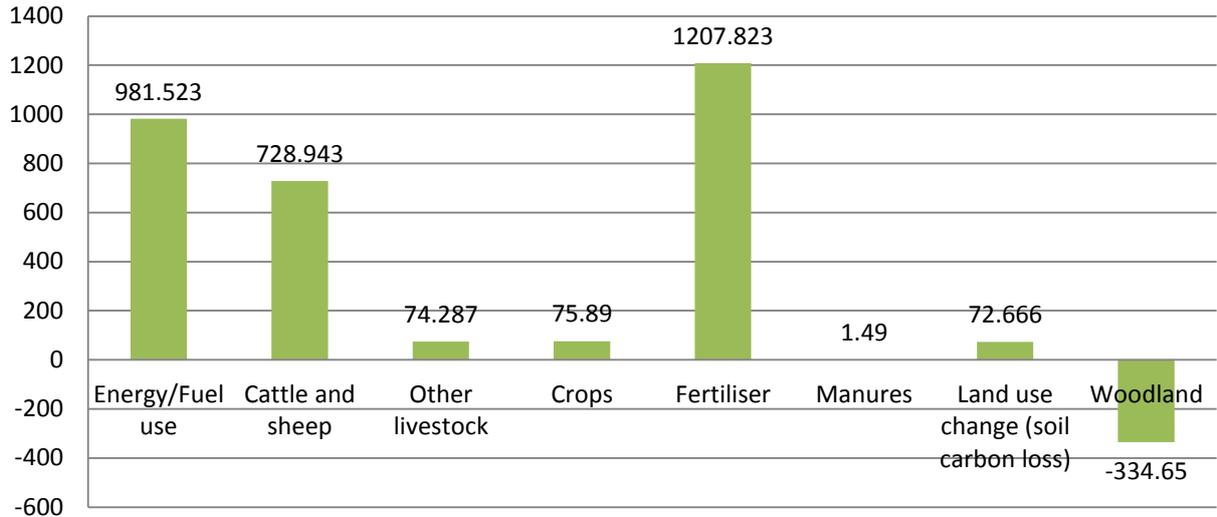
The non-organic herd comprises of 200 Simmental cross suckler cows which are put to Simmental bulls. They calve from September to October and March to April. Heifer calves are kept as breeding replacements; sold on for breeding; or fattened. All bull calves are kept entire and sold fat at 12-14 months old. Non organic barley, oilseed rape, wheat, potatoes, carrots and peas are grown. 12 hectares is rented out to a third party for pig production.

### Carbon footprint

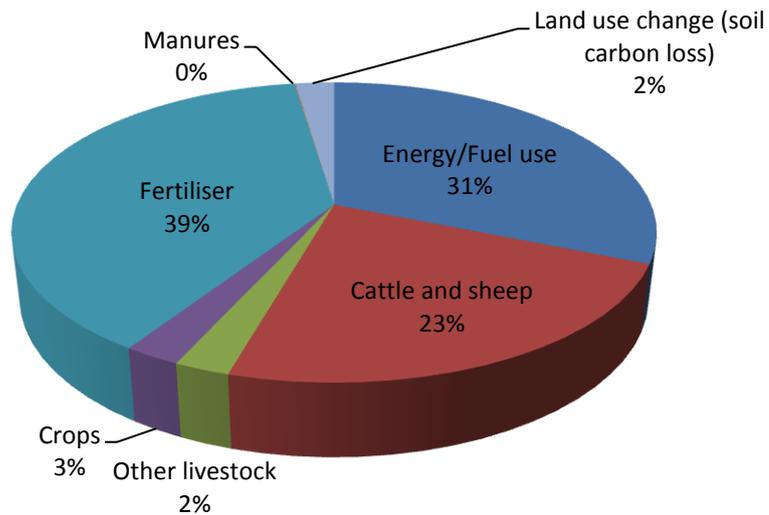
The carbon footprint for Pitgaveny Estate has been carried out using the CALM calculator which is available to use for free at [www.calm.org.uk](http://www.calm.org.uk). The calculator enables farmers to assess the carbon balance of their farm. It produces a 'whole farm' report which indicates the level 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 <sub>2</sub> (kg)	CH <sub>4</sub> (kg)	N <sub>2</sub> O (kg)	CO <sub>2</sub> eq (tonnes)
Energy/Fuel use	981,523.0			981.52
Cattle and sheep		32,280.0	164.71	728.94
Other livestock		2,535.0	67.91	74.287
Crops			244.8	75.89
Fertiliser			3,896.22	1,207.82
Manures			4.81	1.49
Land use change (soil carbon loss)	72,666.07			72.67
Woodland	334,649.52			-334.65
<b>TOTAL</b>				<b>2,807.97</b>
Indirect emissions from manufacture of fertiliser	433,024.0			433.02

## Emissions and sequestration (tonnes CO<sub>2</sub>eq)



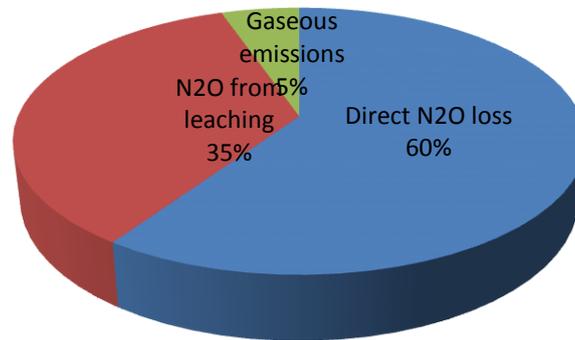
## Source of emissions in carbon balance



The majority of emissions from Pitgaveny Estate are nitrous oxide from the application of artificial nitrogen fertilisers; carbon dioxide from energy and fuel use and methane from cattle and sheep.

**Emissions from artificial fertiliser use** come about directly from nitrous oxide emitted as a result of nitrification, and indirectly through nitrate and ammonia losses via leaching gaseous emissions. The chart below illustrates the proportions of nitrous oxide. Ultimately, reducing nitrogen fertiliser use is the key to reducing nitrous oxide emissions. Using fertility building leys and manure applications within the rotation considerably increase nitrogen available in the soil therefore reducing the need for artificial applications. Emissions from fertiliser use can be reduced further through careful nutrient management, ensuring nutrient supply does not exceed crop demand and that supply is timed effectively to reduce the risk of nitrogen losses and indirect N<sub>2</sub>O emissions.

## Source of nitrous oxide emissions from artificial fertiliser



- Calculate the nutrient balance for each crop to ensure that surplus N is not applied – this will reduce the risk of excess N in the soil and the risk of leaching and gaseous emissions as well as potentially reducing the amount of artificial fertiliser required. The nutrient budgeting program PLANET provides a user friendly method for detailed nutrient planning or a simpler farmgate balance.
- Time applications to ensure that available nitrogen peaks when demand by the crop is highest. This will ensure rapid uptake of available N, reducing the risk of leaching and gaseous losses.
- Ensure spreading is even and consistent – calibrate and service machinery routinely to optimise nitrogen utilisation.

**Methane from cattle and sheep** is released as a result of enteric fermentation. This is a vital part of ruminants' digestive process and can therefore not be eliminated. Management to optimise production will reduce methane as the livestock live and produce more efficiently – ensuring livestock receive a high quality diet, that health and welfare is of a high standard and that fertility is optimised will all contribute to a more efficient system, reducing emissions per kg of output.

In 2009, EBLEX published 'A Change in the Air', the first phase of the English Beef and Sheep Production Roadmap, this was followed by two further reports in 2010 and 2012. EBLEX 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. They found a positive correlation between gross margin per kg liveweight and carbon emissions – for every 5kg of CO<sub>2</sub> 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.