Inshewan Estate, Forfar, Scotland

Introduction

Inshewan Estate comprises of a total of 480 hectares with approximately 60 hectares of rotational grazing and arable land, 200 hectares of hill grazing and 210 hectares of pasture and natural Birch woods, productive hardwood plantations and a mixture of Larch and Norway forestry.

The hill grazing and lowland pasture is leased out for grazing and supports a herd of 200 red deer with sheep grazing seasonally. The arable land is also rented out and is not under the management of the Estate. The woodlands at Inshewan Estate are an intrinsic part of the farm's infrastructure; forming the main commercial enterprise bringing in income from timber sold as both firewood and mill logs; providing shelter to the deer and pheasants on the farm; as well as carrying a cost saving element in providing ample firewood for the farm.

The forestry side of the business started in the 1990's as the Sitka plantations reach maturity. Timber left as a result of thinning was collected initially for home consumption and later to be sold as firewood locally. As demand grew, chainsaws and tractors were replaced with an excavator and harvester enabling the business to expand.

The woodlands at Inshewan are now a significant part of the income on the estate both in wood sold and the savings made in providing their own firewood supply. With a good thinning and natural regeneration program the woods will continue to provide income indefinitely. The hardwood plantation grants provide a steady income for 15 years while the plantation matures. Thinning and re-spacing yields firewood while allowing good quality stems to flourish as mill logs over time.

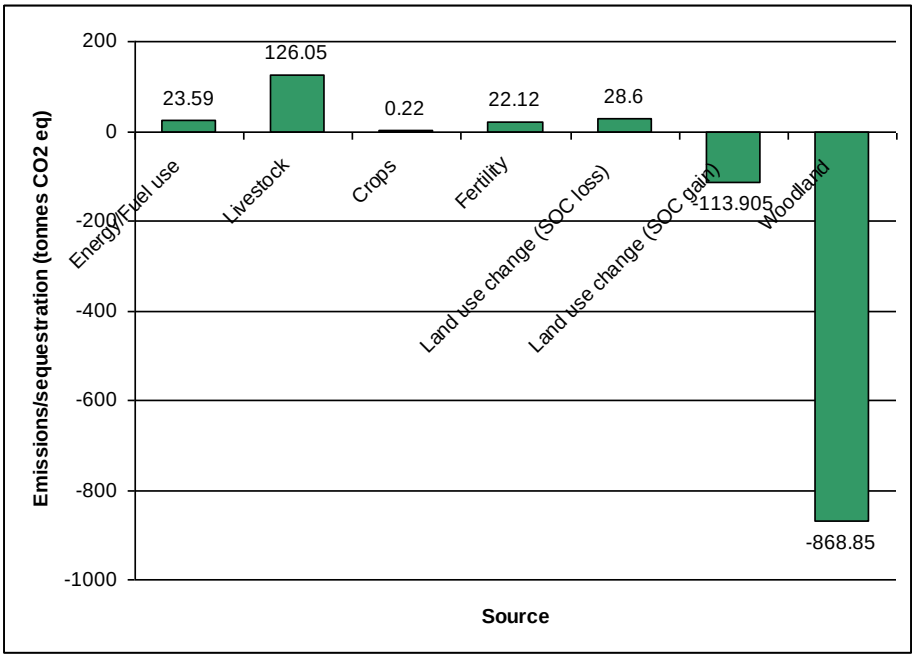
The Estate has plans to plant an additional 10 hectares of broadleaf woodland in the next 12 months.

Carbon footprint

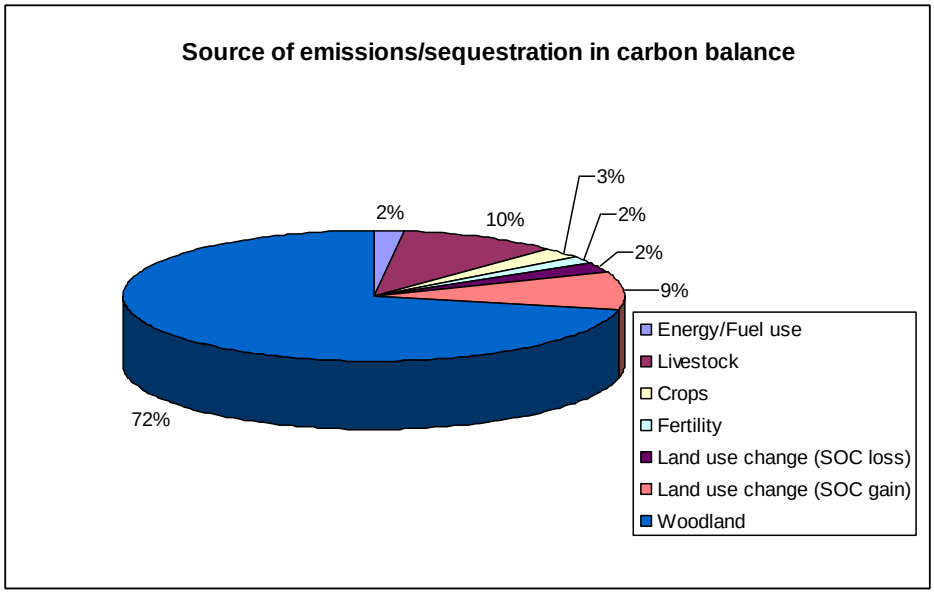
The carbon footprint for Inshewan Estate has been carried out using the CALM calculator which is available to use for free at www.calm.org.uk. The calculator is designed as a monitoring tool, enabling farmers to assess the carbon balance of their farm. It produces a 'whole farm' report which indicates 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.

The footprint of Inshewan Estate can be considered in two ways depending on the boundaries used; as a whole – including tenant operations, or as two separate entities whereby operations owned and managed by the Estate are assessed separately from tenant activities. This report looks at the whole Estate's footprint and considers the footprint of tenant activities and estate activities independently.

Total emissions/sequestration at Inshewan Estate - including tenant activities



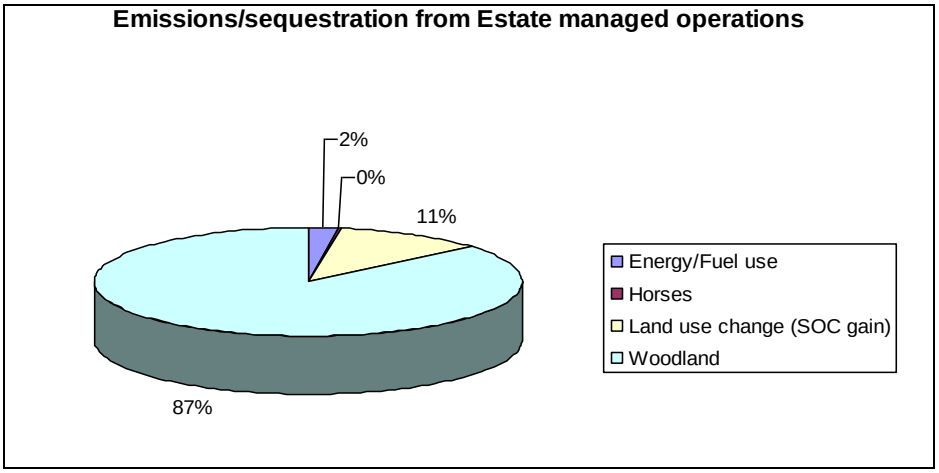
These results clearly show that the carbon balance for Inshewan Estate as a whole is negative.The estate is sequestering more carbon than it is emitting as carbon dioxide, nitrous oxide or methane. 81% of the farm's carbon balance is carbon sequestration by woodland (72%) and soil carbon gain from the establishment of new woodland (9%). The remaining balance makes up the farm's emissions which are predominantly attributable to livestock (10%) with a small proportion of emissions coming from the combustion of fossil fuels (2%) and the release of carbon dioxide when land use has been changed from grassland to arable (2%), and use of nitrogen fertiliser (2%) and the incorporation of crop residues (3%) in arable production



Carbon balance for estate operations only – woodland/forestry & horses

	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	CO_2 eq (tonnes)
Energy/Fuel use	23,593.0			23.59
Horses		116.4	1.18	2.81
Land use change (SOC gain)	-113,905.0			-113.91
Woodland	-868,854.0			-868.85
TOTAL				**-959.17**

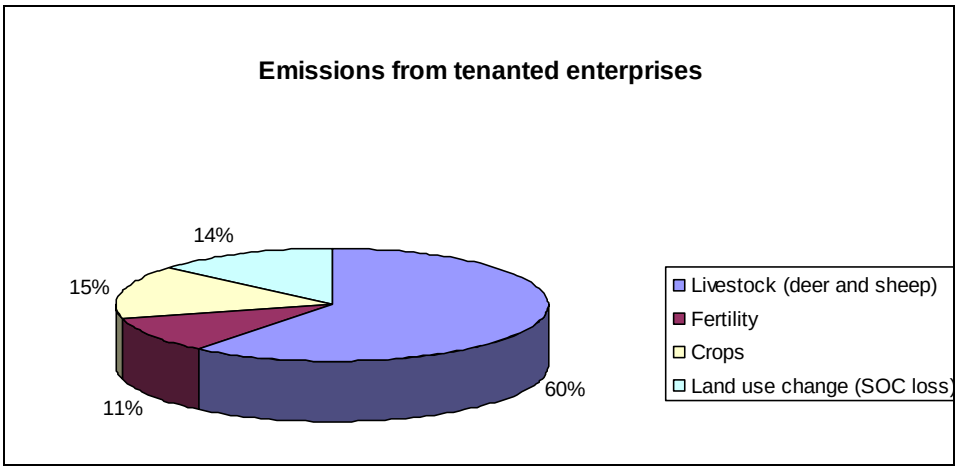
This table shows the carbon balance for the estate managed/owned enterprises only. This is the figure and boundary that would normally be recorded for carbon reporting purposes. It includes emissions from the horses on the estate; energy and fuel use emissions; and sequestration from woodland establishment and management. Emissions are minimal and heavily outweighed by the carbon sequestered by the woodland.



Carbon balance for tenant activities - deer, sheep, arable

	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	CO_2 eq (tonnes)
Livestock (deer and sheep)		3,479.9	170.81	126.05
Fertility			71,340.0	22.12
Crops			101,560.0	31.48
Land use change (SOC loss)	28,600.0			28.60
Total				**176.77**

This table shows the emissions from the deer, sheep and arable activities on the farm. Yields from the arable crops were not available so an average figure per hectare of production has been used to illustrate the emissions from cropping.



The main source of emissions on the Estate come from the deer, sheep and horses – these emissions are nitrous oxide from their manure and methane from enteric fermentation. Both gases are a result of natural processes and it is therefore not possible to eliminate them. They can however, be managed and reduced through production efficiency and careful management.

Land use change emissions have come about from the annual cultivation of grassland to arable land as part of the arable rotation. Carbon dioxide is released as a result of the disturbance of the soil which increases soil microbial activity. The removal of vegetation which would have held carbon in its structure also releases carbon dioxide.

Energy and fuel use makes up 2% of the emissions on the Estate. Emissions from energy and fuel use are carbon dioxide which is released during the combustion of fossil fuels. The adoption of renewable energy electricity tariffs, the increased use of biofuel and improved fuel efficiency will all help reduce emissions in this area.

The woodland on the Estate is a significant carbon sink which will remain in place and continue to sequester carbon year on year.

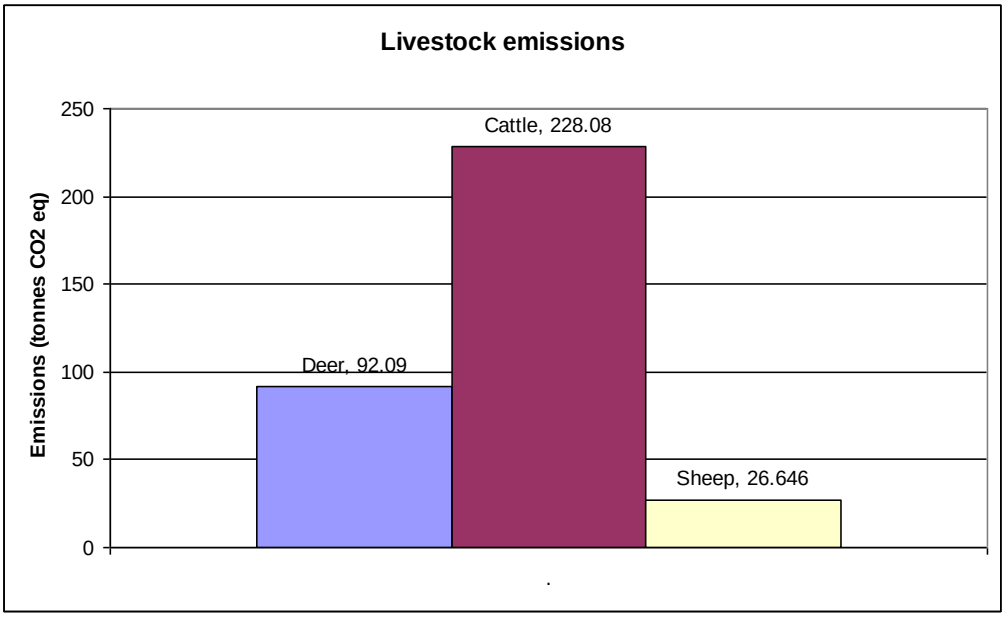
Alternative scenarios – putting emissions in perspective

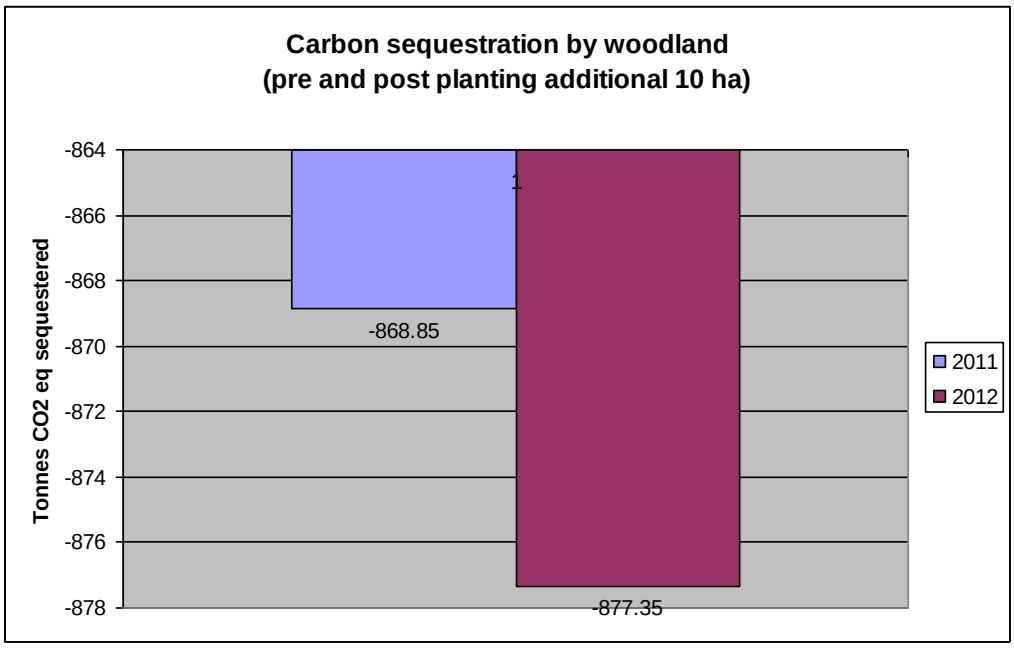
Scenario 1

Livestock on the farm contribute 3480 kg of nitrous oxide and 179 kg of methane to the farm's footprint. The global warming potential of these gases is 21 and 310 respectively – N_2O and CH_4 emissions are multiplied by these factors to convert the figures to carbon dioxide equivalent. The total emissions by livestock on the estate is therefore 126.1 tonnes CO_2 eq

Emissions from the deer alone stand at 92.09 tonnes CO_2 eq.

The chart below shows how emissions from different livestock species varies, it shows how emissions from livestock would be affected if the deer (60 hinds, 100 stags, and 50 calves) were replaced by similar numbers of cattle (60 cows, 110 stores, and 57 calves) or a flock of sheep (100 store lambs, 50 hoggs, and 60 ewes). (All figures shown exclude sheep brought in for seasonal grazing and horses that are on the farm).



Scenario 2

This graph shows how increasing the area of woodland by 10ha will impact on the amount of carbon being sequestered by the forestry enterprise.