

# Farming for a Better Climate



## Improving carbon efficiencies at Auchmore Farm - key focus farm findings

Auchmore Farm, run by Stephen and Sheena Mackenzie in partnership with Stephen's brother Donald, is a hill farm located to the west of Muir of Ord in the central highlands of Scotland.

The farm covers approx. 290 hectares, 170 ha of that being hill ground, with the remaining being in-bye. In addition the farm rents another 100 acres located outside Beauly.

The farm runs 85 autumn calving Shorthorn and Salers. Calves are sold as store. There are 250 pure Cheviot ewes plus an additional 800-1000 lambs bought in to finish. Crops include 8 ha of turnips and 40 ha of forestry.



Stephen and Sheena worked with SAC Consulting as one of nine Climate Change Focus Farms under the second round of the Scottish Government funded Farming for a Better Climate initiative between 2014 and 2018. Two other farms were also selected to participate in the project in the Highland Region – Clynelish in Brora and Corrimony in Glen Urquhart, and together these formed a satellite group known informally as HiFEN – Highland Farming Efficiency Network. Participation in the initiative was voluntary.

### Carbon offsets from renewable energy

Auchmore is a Class 2 Wind Site and has two 500kW wind turbines located on the farm, the first one was installed in November 2013 and the second in December 2014. The wind turbines are a 50% joint venture with one other party.

A 100kW hydro scheme was installed at Auchmore in 2015; this cost around £750,000 and has a payback period of between 6 and 8 years. The hydro scheme is located on the banks of the adjacent watercourse on the farm and with the turbine running at 1000 revs per minute and with an inflow water speed of 250 miles per hour. The station is constantly running and its expected that payback will be achieved sooner than estimated.

Electricity generated from the turbines and the hydro scheme is exported to the grid.

Although the renewable electricity is not used on the farm, generating energy from renewable sources rather than fossil fuels will offset CO<sub>2</sub>e. Estimated quantities are shown in Table 1.

Stephen is interested in using some of the electricity generated for use on the farm, but the current lack of suitable storage capacity is limiting this.

**Table 1: CO<sub>2</sub> equivalent offset generated by renewables at Auchmore**

Year	kWhs	t CO <sub>2</sub> e offset
2015	2,028,310	779
2016	3,840,000	1,476
2017	3,828,800	1,471

## Case Study

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- Optimise the application of fertilisers and manures
- Optimise livestock management and the storage of manure and slurry

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# Findings from Auchmore

## Optimising soil health and nutrient usage.

Soils across Auchmore were assessed by SAC Consulting Soil Specialist Dr Bill Crooks.

The topsoils across the site were all medium textured sandy loams varying in depth from 190 mm to > 300 mm. The soils in themselves did not represent any restriction to potential yield. These soils are however often indurated (have hard layers that can restrict root and water movement). In the upper profile these would have been removed by cultivation but can have an impact on drainage of the lower profile.

Much of the grass at Auchmore is semi-natural and given the geology of the land and the shallow wetter soils, a total re-seed in the conventional sense is not practical. Instead Stephen decided to focus on effective over-sowing as well as continuing to relieve identified compaction through subsoiling, as identified by Bill Crooks.

Soils were already under consideration before participation in the project, with a programme of liming already in place. Although the average pH is 5.9, it is still felt to be slightly low so Stephen intends to increase this to 6.2/6.3 over the following few years.

Although applying lime will increase the carbon footprint in the short term, the benefits from improved grass growth and fertiliser utilisation are expected to be seen in future carbon footprints.

Incorporating red and white clovers into the sward is an effective way of providing the aging leys with a continual supply of nitrogen. In 2014 Stephen started over-seeding clover into the in-bye grassland fields and has since reduced nitrogen applications in the 2015 crop year by 2,388kg and by 3,000kg in the 2016 crop year. Based on a value of £0.66/kg N, that is a total saving of £3,556 and 71,173 kg CO<sub>2</sub>e across two years of the project.

In the 2017 crop year, only 12.6t of Muriate of Potash (MOP) was applied, the benefits of not applying bagged nitrogen will also be evident in the following year's carbon footprint. Going forwards and owing to the long term effect of the clover Stephen has indicated that using a fertiliser composition matching 5:20:20 would adequately meet the nutrient requirements of the farm's grazed grassland, something he has looked for but not yet found. Using this type of fertiliser would potentially result in future savings of £1,485 and 29,722kg CO<sub>2</sub>e, compared to the 15t of 20-9-9 previously applied.



## Improvements to livestock productivity with changes in management.

Pre 2016 Auchmore was selling their August born calves castrated at 8 months, in 2016 Stephen made the decision to sell the bull calves whole at 6 months with the aim of getting them away at a heavier weight earlier and improve feed conversion.

Leaving the cattle entire has resulted in an increase in daily live weight gain of around 15% - 20%. At an average sale weight of 300kgs, up from 250kg that is an increase of 50kgs/head, which at current prices (225p/kg approx) that is an increased income of £112.5 per calf sold. Assuming 20 entire are sold per year that is an increase of £2,250 and 2,500kg of extra output, helping to reduce the carbon footprint by 0.9kg CO<sub>2</sub>e (2.68%).

Another management change that was taken in 2016 that the business started selling lambs store opposed to previously finishing them off grass/turnips. This has resulted in increased grass growth in the autumn and the following spring hence more grazed grassland being available for the ewes and cattle. This management change has also contributed to a reduction in nitrogen fertiliser applications.



## Key carbon findings

- Although already farming efficiently, Stephen and Sheena have still been able to make financial savings of over £9000 due to small changes in practice and reduced their farm carbon footprint by 7% as a result of their participation in Farming for a Better Climate initiative between 2014 and 2018
- 1,471 t CO<sub>2</sub>e were offset by the renewable energy sources in place at Auchmore. Whilst the energy generated isn't currently being used on farm, future developments in battery storage technology could make this possible and provide further reductions in the farm carbon footprint.
- Assuming 20 6 month old entire bull are sold per year as opposed to the previous practice of selling castrated bullocks at eight months, the result is an increase of £2,250\* and 2,500kg of extra output, helping to reduce the carbon footprint by 0.9kg CO<sub>2</sub>e (2.68%). (\*at 225p/kg approx)
- For practical ways to reduce your farm carbon footprint, visit [www.farmingforabetterclimate.org](http://www.farmingforabetterclimate.org)