What's been happening?

Its been a busy summer! In this Newsletter, we catch up with another two of our volunteer Climate Change Focus Farmers, David Barron at Nether Aden and Ross Logan at Hillend, to see how working with Farming for a Better Climate has helped them take a second look at their business and make both financial and carbon savings. Our final meeting at Rumbletonrig with host John Mitchell and family is due later in the summer, so there is still an opportunity to come along to one of our meetings. Keep an eye on our webpages for dates.

In May, MSP Mairi Gougeon launched our new ‘Soil Regenerative Agriculture Group’ of five progressive arable farmers in the North East of Scotland. The group are working together to look at how we can move towards farming with soil regenerative agricultural techniques in mind in Scotland, protecting farm soils and providing a whole host of benefits to the growing crop and environment. We will take a look at the group in this newsletter.

Although emissions from agriculture are being scrutinised, its not all bad news. Agriculture is in a great position to lock up or ‘sequester’ carbon on the farm. Both tree and hedge planting, plus changing the way we manage farm soils, could increase carbon on the farm. For some, this could become an opportunity as more industries look to ways they can offset their emissions. We look at both farm soils and Agroforestry later in the newsletter.

Read on to see how other farmers are tackling climate change issues head on, cutting their carbon footprint and benefiting the farm business both financially and environmentally.
Focus farm findings  - Part 2

Improve business efficiency; save money; reduce emissions

Nine farming families volunteered to act as climate change focus farms under the Scottish Government Farming for a Better Climate initiative. Working with an SAC Agricultural Consultant, specialists and other farmers within their discussion groups, the host farmers looked at practical measures to cut carbon and benefit their farm business. With different starting years and a break in the middle for some due to poor farmgate milk prices, we now have data for some of the farms across five years, illustrating the ups and downs of their carbon footprint. Here are the results from Hillend and Nether Aden.

Hillend

Small changes gave a 6% reduction on the farm carbon footprint and a £16k cash saving.

Hillend Farm is a 110 cow dairy just outside the village of Clackmannan, owned and run by Ross Logan in partnership with his parents James and Anne. The farm extends to 112 hectares, split between 45ha cereals and the remainder under grass for silage production and summer grazing. The dairy herd calves all year round with home bred replacements entering the herd.

Measures reviewed or put in place at Hillend included:

- **Cutting the electricity bill** - Installation of a smart meter to monitor electricity use in the dairy. Variable speed milk pumps, improved insulation of hot water systems and a heat recovery system from the bulk tank chiller to preheat water going to the water heater were all identified as measures that could bring financial savings in the region of £1,500 per year. As Ross was in the process of moving over to a robotic milking system, most of these changes would be carried out during the switch.

- **Improved fuel use** - A 4.50 hectare field was direct drilled as opposed to being ploughed. By reducing field operations, fuel use fell by 140 litres, which at a price of £0.55 is a saving of £77 and 372 kg CO$_2$e. With less soil disturbance, a successful grass crop and reduced labour, Ross intends to increase the use of direct drilling going forward.

- **Improved fertiliser use** - With soil analysis results showing moderate to high P and K levels, Ross was better able to target slurry and fertiliser use across the farm. This resulted in a saving of 8.8 tonnes of both P and K, saving 31.97 tonnes of CO$_2$e and £9,143 over three years.

- **Dietary change** - Ross changed the dry cows diet by feeding more wholecrop instead of chopping and feeding straw. This meant the feeder wagon was running for approximately 182 hours less per year, saving 1,820 litres of fuel, around £1,000 and 4,841 kg CO$_2$e.

- **Better silage** - Ross improved silage quality, knew its value and balanced rations with bought in feed accordingly. Based on a comparison of purchased feed used at the start of the project and the end, there was 63 tonnes less bought-in feed fed, equating to a saving of £2,300 and 34,278 kg CO$_2$e.

- **Getting calves off to a good start** - With a new calf shed, heifer calves were no longer housed in the same air space as older cattle or young bull calves. The heifer calves were kept in individual calf pens, then moved to igloos and group pens. Gale breaks gave calves more protection from adverse weather and calf jackets were put on calves up to four week old. These actions were reflected in calf growth rates, increasing by around an extra 0.15kg per day.

By the end of the project, milk yields had increased beyond what they were at the start of the project but less purchased feed was required. Ross plans to move forward with the new robotic milking facility.
Nether Aden Carbon footprint reflected the changing enterprise

Nether Aden is a mixed, family farm, situated close to the village of Mintlaw in north east Scotland. The farm is run by husband and wife team David and Nicola Barron, with help from sons Jack, Tom and Jamie. Nether Aden extends to 204 hectares growing a range of winter and spring sown arable crops, plus grass for grazing and silage. Livestock on the farm comprises a herd of suckler cows producing finished cattle.

Since 2015, the business has gradually been increasing the size of the suckler cow enterprise alongside working with us as a focus farm. The area of winter cereals and winter oilseed rape grown has been reduced and grass cover increased, along with more cow numbers as calves are being retained for breeding. The farm carbon footprint has reflected this, showing a steady annual increase, peaking at 37% up against baseline 2014 data during the transition period; this figure would have been higher if David had not also implemented a range of efficiency measures. Planned changes at Nether Aden meant less farm output, as grain sales were reduced as the suckler herd was gradually built up. This also meant carrying an increased number of cattle on the farm with a temporary reduction in the number of cattle sales as more female calves were retained for breeding replacements. It will take a minimum of 2.5 to 3 years before the increase in cattle numbers results in an increase of sales off the farm with this then being reflected in the farm carbon footprint. During this period, there are also higher inputs to the cattle enterprises e.g. feed which has been seen in the Agrecalc returns.

Although already technically efficient, David and his team were still able to identify savings; measures put in place included:

- **Hydrogen technology** - By retrofitting a hydrogen electrolyser to the telehandler, David saved 1,083 litres of fuel, equivalent to 43,440Kg CO₂ and £596 per year. At current rates, David could save 17,200 Kg CO₂ and £2,980 over five years.

- **Use of nutrients in FYM from the farm** - Nether Aden was producing approximately 2,219 tonnes of cattle farm yard manure each year. This was estimated to supply 13,214 kg of total nitrogen, 1,331 kg of available nitrogen, 7,100 kg of Phosphate and 17,752 kg of potash. With the fertiliser costs in place at that time, this equated to £12,719 of nutrients being supplied by the FYM on the farm.

- **Nutrient budgeting** - Soil testing, nutrient budgeting and use of composts further identified that David could cut back on some fertiliser applications, saving an equivalent of around £38 per arable hectare or £5,111 per year based on the arable area on the farm at that time. This is equivalent to an annual reduction in carbon emissions of 19,344 kg.

- **Use of green manures** - Like the use of compost, David recognised the opportunity to improve farm soils, targeting the green manures to fields furthest from the main farm buildings which have received less routine FYM applications. In addition, an abundance of insects utilising the crop and birds feeding on them were noted at field visits, further supporting farm biodiversity.

- **Cow type and efficiency** - David is actively reviewing the use of the larger, continental breeds on the farm, focussing instead on the kilograms of beef produced per hectare, rather than the weight of individual animals.

You can read about the changes David investigated, including the use of the hydrogen electrolyser, via the webpage [here.](#)
How could the Focus Farm findings help you?

Over 80% of farmers who attended a climate change focus farm meeting said they would make changes to routine tasks at home.

Our open meetings at the focus farms showcased a range of measures that, hopefully everyone could take something away from and put in place on their farm at home. Based on what participants at the meetings have told us (remember those evaluation sheets you are often asked to complete after a meeting?), over 80% were going to go home and do something differently. OK, so what about the other 20%? The majority of reasons why others wouldn’t be making any changes fell into three main camps - because they were already doing it; not currently farming; or were not the decision maker at their farm.

It’s easy to think that some measures are so small they won’t make a difference or are not worth bothering with. However a £50 reduction here and a £480 saving there, could soon add up. Even though our host focus farmers were already technically efficient, nutrient use has been a common area where most have been able to make substantial carbon and cash savings. Regular soil testing, achieving target soil pH, taking account of nutrients in slurry and manure and topping up with inorganic fertiliser to meet crop demand benefits not only the farm business and future yields, but also the environment.

Notes from the farm discussion group meetings, practical guides, case studies and videos showing what other farmers have done are on our website; an easy way to access this information is via the Downloads page.

We used Agrecalc to measure the farm carbon footprint, it helped the focus farmers look at their business in a different way.

For a free carbon audit, visit Scotland’s Farm Advisory Service

Can we reduce emissions from beef?

If you have beef cattle, you might find these two new practical guides useful.

The guides look at some of the practical measures we can take to move towards ‘net-zero’ carbon emissions.

Keep an eye on our social media feeds and download pages as more guides are planned.

Recap: The main agric emissions

The three main greenhouse gases (GHG) from agriculture, carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), are not equal in terms of their climate change impacts; this can be referred to as their global warming potential (GWP).

Over a 100-year period, methane’s GWP is 25 times worse than carbon dioxide, whereas nitrous oxide’s GWP is considered to be 298 times worse than carbon dioxide. These gases are usually converted to a common unit of ‘CO₂ equivalent’ (CO₂e) to give one comparable measurement.

Taking into account associated land use, agriculture is currently the second largest contributor to Scottish emissions (after transport at 37%), accounting for just over a quarter of Scotland’s total in 2016.

Livestock emissions make up around 48% of the agricultural total (by CO₂e), most of which are due to methane from cattle and sheep. Agricultural soils and land-use change emissions account for a further 43%.

Efficiency improvements, fewer livestock and a rise in the cost of fertilisers have led to a drop in agricultural emissions compared to 1990 baseline levels. There are still lots of things we can do to benefit the business and help to reduce farm emissions.

See how other farmers are taking on this challenge on our webpages at www.farmingforabetterclimate.org

Meet the Soil Regenerative Agriculture Group

New group looking at farm soils

Whether arable or livestock, we all want a productive and healthy soil. There is a growing move towards protection of soil health and acknowledgement of the benefits a healthy soil can give to the growing crop and wider sustainability of the farm business.

Five arable and soft fruit farmers are working with us to investigate and share their experiences around improving soil health. The new group will trial and develop ideas on their farms which could provide practical, innovative solutions to help climate change mitigation and drive low-carbon, environmentally sustainable farming practices in Scotland.

The farmers in the group are

• Hugh Black, Backboath, nr Forfar. Hugh farms in partnership with his father James across 400ha. Hugh grows winter wheat, winter and spring barley, oilseed rape and is the only one in the group to grow potatoes. They operate a six to seven-year rotation with two breaks.

• Ross Mitchell runs Castleton Farm near Laurencekirk in partnership with his father Murray. The business covers over 600 ha, specialising in strawberries, raspberries, cherries and blueberries. Although the land is predominantly managed for soft fruit production under polytunnels, Ross and Murray also have some root crops and daffodils. Ross has recently moved across to no tillage.

• Douglas Ruxton from Moss-side of Esslie, near Laurencekirk. Douglas has been strip drilling for six years across his 121ha arable unit, investing in a Claydon Strip Till Drill and straw harrow. Douglas and the group are already seeing the benefit of his approach on the structure and health of the farm soils at Moss-side of Esslie.

• James Hopkinson of Arable Ventures, near Kirriemuir. Arable Ventures grow winter wheat, spring barley, winter barley, oats, peas, oilseed rape and grass in a using direct drilling techniques over a long rotation across over 1,100 ha of arable land. James has access to dung via an in-house cattle enterprise at Lindertis, providing a valuable nutrient addition to farm soils.

• Ben Barron from Leitfie Farm near Coupar Angus. Ben farms the 200 ha mixed arable and beef unit in Perthshire with his family. Leitfie is the only mixed unit in the group, growing grass for his beef cattle, plus barley, wheat, oats, beans and oilseed rape, with the intention of trying linseed in 2020. The rotation at Leitfie will be a diverse 7 crop 9-year rotation with 3 break crops. Ben has entered his fourth season of direct drilling.

You can keep up to date with the findings of the group through regular updates via our Facebook and Twitter accounts.
**Earthworms required for good soil health**

*Have you got enough worms; how do you get more?*

A healthy soil will have good biodiversity (biology), optimum pH level and nutrients (chemistry) and good physical structure (physics), writes Dr Sammi Dolan, SAC Consulting Soils Consultant. By ensuring all three aspects of the soil are maintained, soils can support crop yields and be more resilient to climate change. More recently, new practical indicators of soil biological health such as earthworm abundance have been developed to help farmers have an idea of how their soil biology is doing.

There are three main types of earthworms: epigeic, endogeic and anecic and the presence of all three types of earthworms has many benefits to soil health. For example, earthworms create channels in the soil which allows water to flow and drain, and plant roots to extend throughout the soil to access nutrients. They incorporate leaf litter and crop residues from the soil surface which can improve organic matter and carbon content. Earthworms are also an important source of food for birds, having a wider ecological benefit beyond the soil. The casts left behind from earthworms improves soil stability and provides a nutrient-rich source of food for microorganisms.

However, earthworm populations are at risk when soils are heavily tilled, compacted or when acidic products such as certain fertilisers are applied. To improve populations, optimum pH levels should be maintained between pH 6.0 and 6.2 on mineral soils. A Visual Evaluation of Soil Structure (VESS) can be performed in-field to check for compaction which can reduce oxygen availability and restrict earthworm growth. Improving soil organic matter content through crop residue incorporation or use of manures provides food and helps retain soil moisture which is also important.

Commercial soil health tests may offer an earthworm count along with advice from an agricultural adviser. Identification and counting instructions are also available for free online. Earthworm counts and identification should be performed in the spring or autumn, when the soil is moist and warm.

Scotland’s Farm Advisory Service (FAS) have a Technical Note on “Soil Biodiversity and Soil Health” (TN721, 2019) summarising the importance of improving soil biodiversity to increase soil resilience – see [www.fas.scot](http://www.fas.scot)
Changing practices in a changing climate
Taken together, small practical actions could lead to big changes

With farming under the spotlight, there are a number of straightforward and practical ways we can improve business profitability, which will in turn help to reduce farm greenhouse gas emissions linked to climate change and demonstrate that the agricultural sector is taking action to reduce emissions.

There's no one measure, but instead a whole range of ideas suitable for most farms that could benefit the farm business and help to reduce emissions through improved efficiency. Tips and ideas are grouped under five key action areas:

- Using electricity and fuels efficiently
- Developing renewable energy
- Locking carbon into the farm
- Making the best use of nutrients
- Optimising livestock management

Between notes summarising ideas talked about at on-farm meetings, practical guides and farmer case studies, there are over 200 easy to read downloads at www.farmingforabetterclimate.org/download/

We have also been working with the Farm Advisory Service (FAS) to produce a range of videos highlighting how other farmers have improved efficiency and reduced greenhouse gas emission. Take a look at www.fas.scot/climate-change-environment-videos/ Here's a snapshot of some of the events the FAS team have delivered over the summer months.

Will climate change your farm?
How can cutting carbon benefit your farm business?

Dairy farmer John Kerr, from Woodhead Farm in Newmilns, who farms in partnership with mum Anne, saved £63,000 and reduced the farm carbon footprint by 6% during the four years that he was a Climate Change Focus Farmer as part of the Farming For a Better Climate initiative. John recently attended a meeting with like minded dairy farmers in Campbeltown to share some of his findings.

John revealed he made the savings through lots of small but cost-effective changes which resulted in improved efficiency of production across the farm. Steps taken by John and Anne at their 180 cow diary unit included implementing a liming programme, producing higher quality silage, testing the quality of colostrum, installing cow tracks to improve grazing management and increasing ventilation and light levels within his cow shed, all of which John felt had also improved his farm business resilience. You hear about some of the changes John made at www.farmingforabetterclimate.org/climate_change_focus_farms/woodhead-farm-ayrshire-dairy/

In case you missed it...
Chat on cover crops, arable rotations and cultivation management

In a recent FAS podcast, Agricultural Consultant Malcolm MacDonald spoke to Harry Henderson, AHDB’s Knowledge Transfer Manager, and later with Gavin Elrick, SAC Consulting’s soils, drainage and nutrient management expert.

Their chat covered a range of topics, from adapting the arable rotation and cultivation management to the benefits of cover crops, soil structure and drainage. You can listen to the podcast here.
Adapting to Climate Change in the Arable Sector

Could crop choice, cover cropping and woodland creation improve business resilience?

Farmers gathered at West Mathers near St Cyrus by kind permission of Eric Scott to share ideas about how they could adapt their farm business in the face of a changing climate.

With topics as diverse as flood management to managing tyre pressures, there was something for everyone. Cover crops and their role in soil protection were a subject for discussion, however it was recognised that the short growing season in the North East can limit options. Anthony Powell from Michelin Tyres showed how using the wrong tyres or unsuitable tyre pressures for field work could increase soil compaction risk.

From possible causes of compaction based on the depth of compaction zone, to carrying out the ‘squelch test’ to assess the risk of soil damage, the Valuing your Soils brochure has some handy field guides and reminders to help us navigate some key soil issues. You can download your copy at www.farmingforabetterclimate.org/improving-farm-profitability/soils-fertilisers-and-manures/ or email us at climatechange@sac.co.uk and we will pop a copy in the post for you.

If you missed this one, there will be similar events for both arable and livestock farmers in Inverness area in October - see www.fas.scot/ events calendar for details.

AgroForestry - could it work for you?

Our regular column in Farming Scotland Magazine looked at the ‘growing’ trend towards agroforestry.

Hedges, hedge row trees, shelterbelts, woodland pasture/grazing and wooded riparian buffers are common place in the Scottish landscape, however, there are real opportunities for further integration of trees and farming, writes SAC Consulting Forestry Consultant Stephen Adlard.

Agroforestry integrates trees and shrubs with agricultural crops or livestock. It can boost farm productivity, improve soil health and help manage water flows, provide livestock welfare benefits, enhance wildlife and contribute to mitigating climate change.

The Forestry Grant Scheme (FGS) offers an agroforestry grant for establishing individually protected trees at either 200 or 400 trees/hectare in sheep pasture. Some farmers have found other approaches to achieve the benefits they want in their particular circumstances. If the land can be taken out of grazing for a period, trees can be planted using a traditional forestry model at 2m spacing. Final crop trees, at a spacing of between 7 and 8m are selected at about 12 years old. Gradual thinning of the other trees starts about this time. The final crop trees are pruned to improve their form and raise the tree canopy. A grass sward under the tree canopy quickly develops. The sheltered environment under the tree canopy brings forward the flush of spring grass and provides ideal shelter and resting areas for livestock. The trees help improve the soil structure and keep the soil drier, thereby also extending the grazing season.

Agroforestry also has enormous potential alongside rearing chickens. The hens are less stressed and range better under the cover of trees and are therefore more productive. Well-designed woodland planting around chicken sheds not only screens the building but can also to help recapture ammonia emissions. More details of this system can be found at www.farmtreestoair.ceh.ac.uk/
Further information and contact details

There is more information about the changes on the host farms, along with dates of our remaining meetings on our Facebook and Twitter feeds.

You can read more about the focus farms, download practical guides and case studies at www.farmingforabetterclimate.org. The Farm Advisory Service (FAS) also hosts a range of meetings and information which could help you to benefit from reducing the farm carbon footprint see www.fas.scot.

Get in touch - contact one of the team:

- Rebecca Audsley - FFBC Project Manager, SAC Consulting Auchincruive Office
  T: 01292 525 089 E: rebecca.audsley@sac.co.uk

- Alan Bruce - Focus Farm Facilitator for Nether Aden, SAC Consulting FBS Turriff Office
  T: 01888 563 333 E: alan.bruce@sac.co.uk

- James Buchanan - Focus Farm Facilitator for Hillend, SAC Consulting Perth Office
  T: 01738 636 611 E: james.buchanan@sac.co.uk

- Sarah Kerr - FFBC Project Officer, SAC Consulting Auchincruive Office
  T: 01292 525 149 E: sarah.kerr@sac.co.uk

- David Ross - Focus Farm Facilitator for Ardoch of Gallery, SAC Consulting Stonehaven Office
  T: 01596 762 305 E: david.ross@sac.co.uk

- Peter Lindsay - Farm Facilitator Soil Regenerative Agriculture Group, SAC Consulting Forfar Office
  T: 01307 464 033 E: peter.lindsay@sac.co.uk

Thank you for reading the newsletter. If you would like to be notified when the next newsletter is out, email climatechange@sac.co.uk and ask to be included on the mailing list. Your email details won’t be shared with anyone else.

You can also keep up to date with the project via Twitter @SACfarm4climate or find us on Facebook.

Farming for a Better Climate (FFBC) is funded by Scottish Government and delivered by SAC Consulting. This Farming for a Better Climate newsletter was funded by Scotland’s Farm Advisory Service.