



# Farming for 1.5°

Independent inquiry  
on farming and  
climate change in  
Scotland

## One farm at a time: different pathways to reducing emissions





# NIKKI YOXALL

Nikki Yoxall worked in agricultural education in England and moved to Scotland into a post at Moray College UHI. More recently, she became an Ambassador for the Soil Association Scotland, joined Nature Friendly Farming Network Scotland to run the farmer steering group, and started an MSc in Sustainable Food and Natural Resources. Alongside managing their farm, with her husband James they run the Grampian Grazers, she works with the Pasture Fed Livestock Association to support knowledge exchange between academic research and practitioners, and is developing an accredited training course on Agroecology with the Landworkers' Alliance.

## FARM PROFILE

They currently own 18 acres in Aberdeenshire, with grazing arrangements for their cattle with neighbouring lands totalling around 120 acres depending on the time of the year. The lands are mostly marginal uplands with some permanent pasture and some woodlands pasture areas. There are no buildings or other infrastructure. They have rare and native breed cattle and sell beef directly to customers through beef-boxes. They describe their farming as agro-ecological in that they manage their food production holistically, completely integrated into the ecological functioning of the land. They will shortly be taking on a 100-acre tenancy near Dingwall where they have plans for setting up a micro dairy and keep pastured poultry.

## MOTIVATIONS/SUCCESSSES

Her experience of running a college farm in England led her to think about how they could make the most of their farm's woodlands by introducing cattle. The focus of reducing emissions on the farm has been mainly on reducing fossil fuel use, e.g. by minimising the number of journeys into town, and by reducing the amount of hay they buy in.

 So you don't like just nip into town. ... you just make one journey like that kind of really basic reduction in fossil fuels.

## IMPACT/MEASURING

They see their tree planting as part of habitat development, nutrient cycling and water functioning. They are already low on emissions. Their farm is small scale and they are able to complete many tasks without specialist equipment, but they have just acquired a quad bike for use on their larger tenancy. They recognise the health benefits from completing their tasks manually, enjoy the work and try to avoid acquiring machinery.

 Our cattle are outside all year round, so we're not having to burn diesel to feed them or to clear them out.

## WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?

The extreme winter this year (an unusually long period of snow and ice) spoiled their plans for keeping their cattle grazing without needing to supplement with hay or silage, which they managed well in previous winters. She accepts that farming is unpredictable and these contingencies might always be needed. Their dependence on other people's land for grazing has also sometimes been frustrating as others may not have the same priorities, e.g. setting aside land for resting. This is also a reason for moving to a larger tenancy. Additionally, they will be able to diversify their income by expanding into dairy and poultry to make their business more resilient.

○ So it was like grass ice, bit of grass sticking up, then snow, then that froze. And so actually the cows just couldn't get through it. So we had to move them off the hill, which threw out our grazing plans, and we had to bring them down onto bales. And yeah, it was frustrating because it was like, oh, we thought we cracked this idea of not having to have forage through hay or silage.

## HOW COULD YOU BE BETTER SUPPORTED?

Scaling up their business (incl. making hay for themselves) would require more machinery, and ideally this equipment would be electric. They would need support, as that kind of capital outlay is impossible for relatively new entrants like themselves. Currently, this equipment is also not available on a small scale.

She also feels that their methods are not supported by policy which prioritises maximising output. There is also not enough expertise available for agroecological farmers and often the advice they get from traditional experts is not suitable for their context. She advocates therefore the work that some organisations do to set up a mutual learning relationship between farmers like them and professionals such as vets in a two-way learning relationship.

○ All of the climate scientists who are looking at this are saying we need to decarbonise, we need to move away from fossil fuels, and our energy needs to come from electricity. But that just doesn't seem to be on the radar in terms of machinery within agriculture on a smaller scale. ...why aren't companies looking at smaller models that could be electric? ...Why can't you get a small tractor that would be ideal for smaller farms or cooperatives or something like that. So that would be really helpful.

## ADVICE FOR OTHERS

She explains how much support she has enjoyed from her neighbours and other farmers and recommends peer and community support above everything.

 And it's about community, isn't it? You can't change stuff on your own, you need community behind you. And peer support is really, really important in that... So, yeah, find some friendly crofters who you get on well with would be my advice for others.



# ROBERT FLEMING

Robert Fleming is a livestock farmer in South-West Scotland. He sits on the Simplification Taskforce for Scottish Government for CAP reform. He was a former member of the Scottish Cattle Industry Group (SCIG) for Quality Meat Scotland, he was the host farmer for Agrii's first Forage iFarm, and is a 2015 Nuffield Scholar.

## FARM PROFILE

Robert has a lowland beef and sheep unit that sits right next to the coast with 240 hectares of grassland. They produce suckler cows, and they have pedigree sheep.

## MOTIVATIONS/SUCCESSSES

In 2015 Robert started doing soil testing and reviewing plans for the longer term of the farm alongside doing a Nuffield Scholarship that showed him more of the world. During that year, he learned especially about the long-term damage that can be done when action is taken as a result of short-term thinking.

 I found that if I focus a little bit more on the soils and got the base of the farm right, it was a lot easier to do everything else.

 ...I've not been an eco warrior, I just feel that we've got a responsibility for what we do know. We try to keep our water courses clear, we try to make sure that the animals are healthy, but it's just those added little things that can really build up.

## IMPACT/MEASURING

He used AgreCalc as part of the Beef Efficiency Scheme.

He also mapped the whole farm for soil productivity. Then took measures to address soil pH by looking at what nutrients were already available on the farm. He used an SRDP grant to build a slurry store and install a separator which enabled him to target the solids and liquids better. These measures allowed him to reduce his Nitrogen purchases by 65% with payback (of the initial investments and elaborate testing) over just 3-4 years and reduced his farm's emissions by a third. He approves of measuring and tracking (e.g. weighing animals and tagging them,

Electrical Identification Data, using different software packages) and is prepared to fund some of the equipment needed for it himself, as it gives him an extra nudge to follow up with productive action that leads to managing his animals and fields better. He reckons that if he can improve his better land to increase yields by say 10%, then he can free up his poorer land to give something else back, e.g. by rewilding some of it.

- We're actually growing more grass and the feed quality has improved just by going back again and fixing that soil. It's just that farmer hat on again of 'I spend a lot of money on nitrogen, so what have I got that I don't really value on farm and I could use better?'
- we had every hectare of the farm that has any application, whether it be slurry, fertiliser, lime, sprays, has any cropping done on it, we marked, so mapped the entire farm. We had the soil productivity done so we knew the depths of the soil and then we got it fully profiled.
- My lime in year one was almost covered by my not purchasing fertilisers or inputs in year two, so it's just a little bit of short term pain for the long term gain of it.
- If I can grow more from my better land, then I can then sideline some of my poorer land to do something else, whether that's for rewilding, or whether like my five-year old said this morning 'Wouldn't it be nice to have a nice pond with some trees round about it?'

### **WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?**

He finds it frustrating that farmers complain about additional tasks such as measuring their animals' health, monitoring or soil testing, and dismiss them as unnecessary hassle, making claims that they know what needs to be done on their farms. In his opinion, these measures inform productivity and can lead to much better management and less waste, and thinks that these practices (of gathering information for planning and monitoring outcomes) are taken for granted in other sectors. This mindset that dismisses these new practices before they have thought about them, needs to change, he says. He thinks perhaps farmers might be persuaded by a little bit more guidance and being shown how even small measures can lead to making more money.

○ And that's the way we've got to target the more stubborn farmers: 'Look we're here to save you some money. We're going to make your life a little bit easier by doing all these little steps and you're going to have more to sell and it's going to cost you less to produce it.'

### ADVICE FOR OTHERS

He urges others to find good advisers, sometimes by paying for them, especially around soil science. He has found that there is a lot of good information out there, and also experts who can help break it down to help you understand what it means for your farm and how to maximise its benefits. Then you need to use that advice and take informed action.

○ That's what the industry needs in the next two years, just a willingness to look and listen and try. Nothing we can prescribe or advise is going to work for everyone but you learn a hell of a lot by trying. And if it's based on good principles, you can tweak it to your system and make it work.

○ It's not one big step, it's all the little marginal gains that add up. We've just got to find those five or ten things that the farmers can find that are doable and the cumulative effect of it.

○ That's the one thing I would say is: have good advisers or good advice or go out and learn it. And make sure you understand it or you understand the person who understands it for you. Break it down to your level. I still don't understand soil science, but I've got really good advisers that back me up and the results are out in the field for everyone to see.



# RUSSELL BROWN

Russell Brown farms in partnership with his wife and their two sons. He has been the Chairman of NFUS potato working group. At present he is the Chairman of the Scottish Potato Co-op, a group of 16 potato growers who have set up the co-op to market 70,000 tonnes of fresh potatoes.

## FARM PROFILE

They farm over a 1000 ha of arable land in Northeast Fife and have a contract farm in Perthshire. They are mainly arable, low-ground. They grow about 150 hectares of potatoes and have a small flock of 250 ewes.

## MOTIVATIONS/SUCCESSSES

His first initiative around climate change was in 2010 when they applied for permission to get a wind turbine for energy generation that took three years. It was quite an investment at the time but financially they did very well with it. The hardest was to get through the planning permission.

In terms of lowering carbon emissions on the farm, the turbine helped. He sees lowering carbon emissions on the farm as a slow gradual process.

 The turbine was obviously successful, and we would have liked to have added to that, but we were having difficulty getting access to the grid to put more electricity in.

## IMPACT/MEASURING

They did an AgreCalc audit for the first time in late 2020 which cost £500 (the price put him off doing a second audit on his other farm). Follow up actions have been less than they had hoped. Minimum till especially was limited, due to their stony soils and weather constraints.

 £500 I thought was just excessive for that thing. I don't see how it cost £500 given the time that was involved in doing it, but that's one of the issues.

## WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?

He thinks that there are too many unanswered questions both in terms of the science and in terms of what the policy makers have in mind. Until these become clearer, he is not sure what else he should be doing. There is not enough information to inform his decisions and he is also reluctant to make any moves that will cost him a lot of money.

 I think we're pretty much the same as a lot of people – we're sitting waiting to see what the policymakers are going to do. Most people are not going to move on if it's going to cost them money to reduce the carbon, their carbon output.

### **HOW COULD YOU BE BETTER SUPPORTED?**

The biggest drawback he thinks is the lack of confirmed research to inform the decisions they should be making.

 I do think there needs to be more research. I think there's too much of an argument at the moment. The science hasn't proved itself in [terms of] which direction we should all be going, so there's too much of a debate. I think we have to get better information so that we can all make better decisions.

### **ADVICE FOR OTHERS**

In terms of advising others, he thinks everybody will make their own decisions as every farm is different, e.g. in terms of whether there is woodland or where best to keep livestock, and there are no obvious answers to these questions yet.

 In our area in North East Fife, there's actually a lot of a lot of woodland and potentially a lot of trees, and it's just how it all works - are we going to put trees on higher ground, that means more stock on the lower ground? There's a lot of these questions and I just can't think we can answer them all.



# TOBY ANSTRUTHER

Toby Anstruther (with estate manager Sam Parsons) took over Balcaskie in 2002. He founded Food from Fife (a membership organisation supported by Fife Council that brings together food and drink in the region), and he was instrumental in the set-up of the East Neuk Estates group and the East Neuk Community Action Plan project.

## FARM PROFILE

Balcaskie Estate covers around 2000 ha from the Fife coastline at St Monans into the hills behind, with a mixture of let family farms covering almost 1/3 of the estate and in-hand farming operations. Since 2016, around half of it has been in the process of conversion to organic livestock production with minimum bought-in inputs aiming for a self-sustainable environment. Species-rich grazing with low-stocking density of both cattle and sheep is maintained to build maximum fertility of the pastures. Rotating crops including barley, beans, radishes and vetches ensure soil health, rich feed for livestock and high biodiversity. There are commercial crops including oilseed rape, barley and wheat destined for local milling and craft breweries. Woodland provides habitat and shelter for wildlife and livestock, and fuels 3 biomass boilers that also heat local business units and residential properties.

Precision farming methods are used to maximise efficiency and minimise waste, and the data and high-tech equipment (incl. GPS and a weighing bridge) is shared with neighbouring farmers. Ongoing conservation projects in partnership with organisations such as the RSPB, the Bumblebee Conservation Trust and the Barn Owl Project, large-scale hedge planting and active local water management have increased biodiversity and wildlife in the region including around local rivers and their entry into the Firth of Forth. The estate has built an active covered market space that also houses local producers and restored a local Inn to create local employment and ensure the farm produce is enjoyed locally.

## MOTIVATIONS/SUCCESSSES

Over the last 20 years they are seeing the changes in weather. Extremes are becoming more regular and seasons becoming shorter. This has triggered concern about bigger issues that really need attention as the things they were doing in the past are no longer working. This sparked the move towards organic conversion and generally more sustainable farming and increasing biodiversity, with a range of associated initiatives including miles of hedges and woodland planting, for animal shelter (for both wildlife and livestock), biomass boilers to reduce reliance on fossil fuels, and shifting away from using conventional farming with fertilisers and other chemicals by doing less ploughing.

○ We see that the springs are starting to become drier earlier, having had wetter winters and the knock on effect of that as we go rapidly from saturated soils to dry soils and plants are struggling to keep up with that. And then our grazing system, we see fewer and fewer grazing days each year. ... then soil conditions can't cope under the farming system that we were running. And so we had a longer winter. And it's a vicious cycle because then you have to grow more forage to feed your cattle over a longer winter.

○ We probably became interested in climate change through interest in biodiversity, and that really led to a sense of change. And then climate change fitted in very much to that. I think climate change is on such a long cycle that it's really, really difficult to get your head around.

## IMPACT/MEASURING

They emphasise that is not easy to measure whether their methods are resulting in carbon reduction. For example, they reduced their use of fertilisers purely because of the intensity of carbon used in their production 'upstream', but now the estate's overall carbon per tonne of grain has probably increased (e.g. on drying their grain and cultivation). Similarly, they have increased the number of ruminants on their farm which, according to some experts is a good thing (as it is a way of farming more regeneratively and mob grazing is generally a positive move), but on the other hand, thinking specifically about methane output, this would definitely not be something to aim for. Similarly, they are farming their cattle less intensively and their lives are longer for a range of good reasons, which, by most metrics is a negative.

They have used AgreCalc for three years. The results have been often misleading, favouring intensification as the solution, as it does not look at where methane is recycled from. It also does not count a range of carbon costs that are externalised, such as soya feed for their chickens that is imported from abroad.

It is also hard to see the effects of newly introduced practices (e.g. minimum ploughing) as they take 3-4 years at least. Another factor that works against trying to do more is that farmers are working against the economies of scale. Unlike other sectors, their costs are going up per tonne of product. The new practices also require a lot of investment such as new equipment (e.g. combine harvesters and grain dryers) partly because the equipment in their possession has resulted from years of upscaling and cannot manage smaller-scale processing without complications.

○ You know, we've done a whole lot of things which we hope will improve carbon emissions. We've moved over to biomass boilers. We grow the trees for the boilers, etc., so we can see a measurable reduction in fossil fuel usage. It's fossil fuel usage that we can measure. So that's the easiest thing to measure in some ways. And we're planting lots of trees. We can measure how many miles of hedges we plant for how many trees we plant. But those are sort of proxies that we think are trying to or are improving our carbon footprint. But we don't know whether they are.

○ [AgreCalc] is getting better, but it's still a long way from being a reliable source and the results have come from it are potentially very misleading, unless you've got a very fixed view of what you want to do.

○ A lot of this stuff, you start with a toe in the water with smaller trials or smaller areas, and you it's easy to forget how huge the effect of an economy of scale is. And so you give all that up as soon as you do a trial. And some of that is just about fixed cost. But some of it is actually about equipment. You know, combine harvesters that can't do a small amount, or driers, that can't do a small amount. And so then, you know, once you add in the cost of all the workarounds and everything else, it makes what was quite a small sort of trial that just allowed you to have a look, into something that feels like a nightmare often. And then you just have to push that through ...

### **WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?**

It's especially hard to do trials as it is not clear which of the links in the chain need adjusting and there is not sufficient information on what the links are and their relationships. It is also often too big of an investment to just try things out blindly.

The system has been set up to increase efficiency and economies of scale. It is much harder to downscale, especially since downscaling means using more labour. Also, there has never been any capital in the system to make investments for real change which requires serious capital.

Additionally, farmers no longer have the expertise to know how to tweak current processes as they have been in the hands of agri-businesses with commercial interests that have persuaded them to gradually increase their inputs. It then becomes difficult to reverse this as, to get that right, would need a more sophisticated understanding which farmers do not generally have themselves.

○ So we were just going to trial livestock. We could have someone who could we could borrow fencing from and we could borrow all that other stuff from that you need in order to do the livestock. But of course, you can't do that, certainly not with things like fencing. And so you have to go in in a much bigger way. It's much bigger. It's a bigger step to sort of go in then than you really are comfortable with coming from a position of relative ignorance.

○ And we have spent 60 years in perfecting this of economies of scale and cost of production, per tonne, and basically it's very easy to scale up. There's always a bigger combine, a bigger tractor. Yeah, there's always a bigger and there's always a more efficient. There's always the latest technology that enables one man to do more work. When you downscale, it's really difficult.

○ We've picked up various bits of funding for agri-environment schemes, but without those, there isn't enough surplus left in the cash flow to finance system change. And if you look back in agriculture, there never has been. So system change, whether it was drainage or infrastructure, buildings, etc, is always being funded somewhere along the line because there's not enough capital left to reinvest. And if we are serious about changing the systems in agriculture, there is a serious cost involved in that.

 Our business really wasn't to be an expert on everything. Our business was to be managers of land and long-term ownership and stewardship. And so historically, that's meant bringing in people from outside to be experts and to do whatever it is they do to a really high standard. And on a blank sheet of paper is really simple. We basically open up to a whole heap of people who are experts in pigs and poultry and dairy, and we become a complex, multi-faceted business overnight with some fantastic people around us. ...And so it's just there's little sort of moments that were common sense before, and that common sense has been stripped away and lost across large swathes of the farming of farmers and the farming workforce and replaced by the bag or the bottle, really.

### **HOW COULD YOU BE BETTER SUPPORTED?**

Support for selling organic produce is lacking, yet the costs of producing it are higher. There is not the same market for organic produce, nor is it easy to sell the organic produce when it almost always comes in smaller quantities that result from more nature-friendly methods.

 Every person who goes into organic farming says that you don't realize it till it actually happens to you, is that we've had to become more than farmers, that we've had to think much more about the product and the marketing and so on to go on from there because you're desperate to try and grab a little bit more of the margin.

## ADVICE FOR OTHERS

There are lots of new developments in regenerative farming and cheap ways to get started as a new entrant at the moment. So if you are able to keep an open mind, there are lots of possibilities for an interesting career. A good way to learn, is spending time with others who are trying out things and see for yourself. Long term data are also really important to build a sense of the longer term trends that will help forecast future scenarios. Regional data should be compiled and made available publicly so that everybody can contribute and access that data to build a better sense of what is going on in their region.

- Up until 2016, when we started the organic conversion, I'd spent 20 years or whatever in the industry and I was bored with farming. It wasn't interesting. Just a sort of calendar of repeating boredom, actually. And since then I have become much more interested in it.
- Almost everybody will say, yes, if you ring them up and say, can I come round to spend a few hours walking around with you? And it's just really useful to do that.



# NIGEL MILLER

Nigel Miller is a graduate of the Royal Dick School of Veterinary Studies. He worked in the Highlands in a mixed farm animal practice before returning home to the family farm partnership in the Scottish Borders. Nigel is a past chair of FWAG Scotland and the NFUS Livestock Committee and held the position of NFU Scotland President over the period of the last CAP Reform. He has been a board member of SRUC and SAC Commercial and today is a board member of the Moredun Research Institute and Chair of Livestock Health Scotland.

## FARM PROFILE

Nigel describes his family's farm as a typical upland farm of about 550 hectares. He runs it in partnership with his sons. The steading is at 600 feet and goes up to over 1000 feet with rainfall of about 40 inches. More than half is unimproved hill, long-term permanent pasture for rough grazing. It's hilly and divided by dykes. There are about 800 breeding ewes (they're expanding the numbers), and 150 cows (breeding heifers whose numbers he is reducing). They also grow spring and winter barley, most of it for feed, some for sale, and they have recently diversified into wood processing.

## MOTIVATIONS/EARLY SUCCESSES

Over the years Nigel introduced a number of agri-environmental features on the farm including lots of new hedges and about 10 little patches of woodland in different corners.

○ I think it's probably a 'drip drip' process which gradually builds. ...probably over the last five years I've realised that it was really going to be the real deal and I've thought of going organic for that reason, but I haven't done it as yet.

○ In some ways, I think that it's not right for the old people to pass their views onto the next generation, so I think it's up to the next generation to actually do their own thing and change the world.

## IMPACT/MEASURING

He uses AgreCalc as a benchmark for his farm and maintains that we need different benchmarks and different journeys for different farms. His farm has a lot of natural features, so it should be net zero. He was pleased to see that the latest version of AgreCalc now includes soil

sequestration and hedges, so it reflects the science better and this data improves the national inventory. He recognises that this is not necessarily as useful for other farms, especially where there is more improved land with intensive farming going on.

He thinks there should be action on precision farming on these farms. He also thinks it is unrealistic to expect all farms to make that complete journey, and that some High Nature Value farms will have to carry more emissions for others. Base payments would have to incentivise the latter to be carbon sequesters and biodiversity providers, perhaps with production ceilings, as they are doing this for the public good.

On his own farm, he has improved his baseline quite a lot by introducing hedges and woodland. Next steps are further reducing his number of cows (and the inputs related to them), selling more barley (rather than feeding it). Looking ahead, he is thinking about agroforestry, though his first project application for this has recently been unsuccessful which was disappointing. He is also confident that he can do more around handling his natural manures and dung more efficiently, and using more clover (he has already been doing some for years) thereby reducing his use of nitrate and fertilisers more significantly. The metrics on methane means that it will be quite an effort and will take a few years, to effect further reductions, especially if he wants to stay with his ruminants.

 You've got the basics there now: you've got the crude emissions from the enterprises, you've got the soil sequestration, you've got a bit of woodlands and hedges. In reality on most farms the woodlands aren't mapped properly so you're not getting a true count and there's also other features like wetland, scrub – ineligible land which comes in various forms which probably sequesters carbon – and I think that that's what would give you a decent baseline.

## **WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS/SUPPORT NEEDED**

Government should be clear to him about what they expect from farms like his over the next 20 years so they know what they are aiming at. They then need to support this with total payback. For example, where government is putting in electrical charging points and collaborative hydrogen projects, they also need to be supporting on-farm renewable energy generation, especially for arable farmers. Some flexibility is required about how you make this transition to electric, to protect smaller farmers from going bankrupt.

There also needs to be capital grants to upgrade farm infrastructure e.g. for dung sheds to store solid manures under cover (for composting). This should also extend to upgrading animal housing as this is an area where farmers are currently needing to make a lot of investment (e.g. to improve dung scraping).

In the arable sector, he sees a lot more potential for monitoring and mapping development, e.g. of chlorophyll intensities to get Nitrogen Use Efficiency up. Again to engage farmers, there will need to be financial incentives.

Other upcoming additional costs that need to be compensated for are the use of nitrification inhibitors, slow-release fertilisers and feed additives to reduce methane.

Introducing these measures in the UK is not optional as current world trade patterns will encourage cheaper international imports that will undermine UK agriculture if we do not stay on top of that.

In the end, he thinks, the sooner we have better modelling tools for farmers to work out how the various interventions affect their emissions, the better.

-  I have been to various climate change monitor farms and events and there are some really good farms, and they were some really interesting days, but they're more about efficiencies and waste saving, and I suppose I was a bit frustrated that that's not really going to take us there.
-  ...we need to know what the next 20 years looks like ...I think that the end point, or knowing what you're aiming at and being comfortable with that is useful, or knowing that you can be viable or sustainable on something that you want to do is pretty important really.
-  You might get a read out of your carbon efficiency or footprint of production, but it also would give you the level of methane and nitrous oxide and carbon dioxide emissions change. That would be an amazing way to sense test or gauge the value of an investment before you do it. We're in that phase that a lot of people might want to do that, so getting that fast would be useful, getting it in 10 years' time is too late.

## ADVICE FOR OTHERS

Nigel recognises that every farm will need to make its own decisions and find its individual journey. He would encourage everybody to look at some of the research that is out there, to see what all can potentially be done. They can then use advisors to help test their concept.

 ...even if you're not going to do all of that, looking through it actually makes you think of your own enterprise and see your strengths and weaknesses. It's easy to get stuck in a rut and not be self-critical. I think that there's other things like that. If you look at the WWF report, maybe it's not going to be totally delivered as it is, but the cost benefits and the updates on various measures make it a fantastic catalogue of potential interventions you might think are good, and maybe you want to do a checklist.

# MARTIN KENNEDY

Martin is currently President of NFU Scotland. He has spent over 20 years working with Borders farmers to deliver practical conservation projects on the ground and spent 15 years as a Senior Conservation Adviser with Borders FWAG. This was followed by 4 years as a Conservation Consultant with SAC Consulting.

## FARM PROFILE

Martin and his family farm cattle and sheep in the uplands of Highland Perthshire ranging from 800 feet to 2500 feet. They have 600 breeding ewes and 60 cows split between Continental ewes on the low ground and Cheviots and Blackies on the high ground, and Continental cattle on the low ground and Highland cows on the hill.

## EARLY SUCCESS

They plant crops on which to finish off as many lambs as they can. In the uplands, the topsoil for growing their crops is shallow so they always ploughed as shallow as possible to avoid bringing up the less fertile soil. They bought a direct driller 8 years ago. Direct drilling is now helping their soil fertility and simultaneously helps to keep carbon in the ground.

 When we looked at direct drilling, it is a way in which we can help the fertility in the soil, and then it became a win-win situation because we realised what was happening with climate change as well. It tied in really, really well.

It's about looking after soil health. Now we're not ploughing that soil anymore - we're getting a better crop and looking after soil health better and in the following year, we've got a better and more fertile soil for our grass to be more productive when we reseed the field again. So, we can finish all the lambs off on the kale and the turnips that we direct drill.

## IMPACT /MEASURING

They did three carbon audits through the Beef Efficiency Scheme. The fact that they are not ploughing has helped reduce their inputs. Soil testing, however, has had the biggest impact in enabling them to refine inputs. Four years ago they entered into a five-year soil test and soil mapping program. The tests raised concerns that they were not paying enough attention to the soil which showed excess phosphates, almost to the detriment of the uptake of nutrients in a lot of the plants, and low lime levels. Since then, they have continued without ploughing and stopped putting on phosphates to help rebalance the soil and make it more productive.

 We were absolutely through the roof in phosphates, we were quite low in lime in some areas, and yet we were using GPS testing so that we put lime on at a variable rate.

The high phosphates were because of traditional farming practice with us putting a 2-1-1 type fertiliser on. There was no need to put as much phosphates as we were putting on. ...That was a challenge and we're still on that.

### HOW COULD YOU BE BETTER SUPPORTED?

Martin has learned that advice has to be tailored to individual farms and circumstances if it is to be worthwhile.

He maintains that everybody needs to do soil testing but recognises that for government to support this widely would be a very costly exercise. Yet, he has learned that there is a lot to gain from getting the balance in soils correct not only to maximise production but also because it's potentially a massive carbon sink.

He also suggests that farmers need assistance when it comes to carbon audits, if anything because we need to establish a baseline, but again recognises that this is a complicated challenge that we have not yet found practical solutions to. He has hopes that we will get to a future soon where farmers can do their annual carbon audits just by feeding in their inputs.

 Advice that's fit for one farm is maybe not fit for another – it depends on the enterprise, it depends on the farm, it depends on the soil type, topography, everything.

 ..but it's not just a case of 'let's do a carbon audit' because, well, where do we start? That's the reality. We need to do that to get a baseline of where we are, so I think help with that is going to definitely be required.

 It would be great to get to the stage, and I'm sure it will come, whereby we've got an IT system that we can put our inputs in, and we have a multi species database that has recorded everything that's on farm, and we would be able to do an annual carbon audit just by putting our inputs in. We're not at that stage yet, but that's what we should be striving to achieve.

## WHAT HAS NOT WORKED/IS FRUSTRATING/ CONCERNS?

Agriculture is doing a lot to be part of the solution when it comes to climate change but it does not get that recognition from the general public. Farmers need to work more on making people aware that Scotland is actually in a good position, and to get the public on their side.

The agri-environment schemes would have more impact if they allowed everybody, including the smaller units, to qualify for participation in these schemes, as NatureScot is considering more recently. Farmers and crofters know better than anybody else what they've got on their farms in terms of biodiversity, so they need support with recording that and help with how you can actually enhance or at least maintain it.

He is keen for a future payment scheme to change away from payments based on land occupation. Instead, farming methods and outputs should be recognised in the calculation of these payments.

One other concern he has is about glyphosate which is the one chemical they used four years ago to burn off old pasture to ensure a productive crop of grass for many years ahead. By not ploughing, they keep the quality of the top soil intact to support a good crop each year. The one-time use of glyphosate also ensures that they do not need to use any further weed sprays for years. The biodiversity is still maintained: they get a lot of field mice and animals that are running about on the top of the turf because it's not being ploughed down.

- We've got an industry that is keen to do everything it can, and we need to get consumers on our side because that's really, really important.
- [About biodiversity schemes] Why not allow everybody to do what they can and play their part, and get the recognition for it? We just want to maintain what's there on farm because it's very, very positive. The frustration is that they don't encourage everybody to get involved.
- [About payments] It's not about where you are or how much you've got, it's about how you farm it, what you do on that land. I think that's what should be recognised in the future
- That [glyphosate] is a big worry and that's applicable right across the arable sector as well when it comes to minimum till (it doesn't work everywhere) or no till. Without glyphosate that's a real problem. There are huge environmental benefits [of using glyphosate] that are sometimes not seen.

- The alternative to glyphosate will be us going back to ploughing because we've got no other way of putting these crops in. If we go back to ploughing, that will actually require us to use a lot more chemicals on the ground and will not allow us to look after the soil health to the same extent as what we're doing just now.

### **ADVICE FOR OTHERS**

His advice is to pay attention to soil health, which, unlike in the arable sector, has not been done enough. Their farm is saving quite a bit because they're no longer putting phosphate on and won't be for two, three years yet until they restore the balance. Soil testing is therefore not just a money saving tool, but also a tool for enhancing soil capacity and its ability to hold carbon.

- So you're winning both: you're getting your soil to be more productive, you're enhancing its capacity and its ability to hold carbon, and you're saving as well, just by doing a proper soil analysis. It's actually really interesting once you get into it, and it's something you wouldn't not do in the future.

# MALCOLM HAY

## FARM PROFILE

Malcolm's farm Edinglassie is an upland sheep and native breed cattle farm near Huntly, Aberdeenshire which has been organic since 2001. The farm has extensive peatlands and since 2015 he has been restoring these with the help of peatland restoration grants from Nature Scot.

## MOTIVATIONS/SUCCESSSES

He has been interested in changing his farming practice for 20 years or so since converting to organic, and currently he is specifically focusing on reducing fossil fuel usage.

Despite it being an upland farm, he keeps his calves and lambs on the farm to finish. Financially this is the only way as there are no active markets for selling stores for what they are worth. He has recently put effort into replacing his diesel-fuel powered machinery with electrical machines and vehicles, but he is finding this hard going as the models he is trying to order are not available and, in some cases, the technology simply does not yet exist. He recognises that this is an issue everybody deals with and will resolve itself in time. There are limitations to the savings he can make (e.g. the size of his farm means he needs to do a certain amount of driving on a daily basis).

- It's been a sort of pretty much one-way traffic of people saying that farming needs to clean up its act.
- I tried to buy a new Landrover Defender which says it gives you 30 miles of electrical mileage, then kicks into a very expensive petrol engine. But there were no production slots available ... I can't even order it ... It is very frustrating. Maybe we're trying to go too fast. I don't know. But those are the big gains if I can get rid of my fossil fuel usage. I mean, that would be huge.
- It's a global issue because we have not yet figured out how to make powerful enough machines work to work off electricity or hydrogen. So that will come presumably in due course.

○ And to consider the size [ of my farm]. I'm afraid you do need fuel to be able to get around. It's not like operating a croft where you do everything by mule. My daily round trip here is twenty five miles. And that is just going round everything...

### **IMPACT/MEASURING**

Tree planting shows up in his carbon audits (using AgreCalc) as his biggest early success. But this does not present a complete picture of the farm's carbon savings or emissions. Specifically, for example, it does not include the work he has done on restoring around 2000 hectares of peatlands or the difference made from renting out of a dozen cottages to local employees at affordable prices, or a number of other factors.

○ If you look at my carbon audit it would be the number of trees I've planted, because it tells me that I spew out 1.3 billion kilograms from the place and I sequester 1.8. In theory, it's pretty good. Now, I know that's not right ...and it doesn't even take into account a lot of peatland restoration work that we have done as well, that might not be accretive, but certainly stopping any further damage. I mean, it's a very complicated picture and nobody has the answers and the figures are all over the place.

### **WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?**

Mainstream organisations do not engage seriously with regenerative farming methods. Their research into it is very limited, they only scratch the surface of what is actually happening in practice. There is a complete lack of practical information, and there is no guidance anywhere on how farmers are supposed to move forward in terms of tackling climate challenges. There is also complete uncertainty about post-2024 farm payments, which does not allow farmers to plan their next steps.

He has found groups on social media that are actively engaged around these issues, but mostly these are small farmers, experimenting with things on a very small scale. They do not give him a basis for making changes on his own farm, as there is too much risk associated with rolling these very small pilots out on the scale required for his farm.

Most of these practices require large investments (e.g. on buying water troughs and electric fencing) and a number of additional staff to implement them, which makes them impractical at his scale. He admits that the social media platforms are interesting and there are many of them. They provide individuals with peer support around everyday problems and at times good advice. However, they are disjointed, often not conclusive, and not what he is really looking for which is solid technical advice for larger practitioners.

- ...one of the frustrations is there's kind of no roadmap anywhere. There's no one saying, well, why don't you buy this machine instead of that machine or why don't you do this instead of that so you have to do it all yourself somehow. And it's really quite difficult.
- ...lacking in support is in simple advice on farming, for example, holistic or regenerative agriculture. I went on a course two years ago and I was absolutely fascinated by it, but when you try and translate it back to your own particular circumstances, there are all sorts of issues. And you know there is no help anywhere to figure out how to overcome some of those things? Does it suit this type of soil structure? How should I manage it without doing too much damage? Or can I do it with virtual fencing? There are so many things and it's really, really difficult to get any information.
- I think the most frustrating thing for me is lack of take up by the SAC of some of these regenerative methods, which I've seen in my own eyes, are obviously, incredibly powerful weapons for global warming and biodiversity. And there is just no take-up. or nobody seems to want to know. ...There is no research going on, no meetings going on where this sort of stuff is shared. ... And this is the one place crying out to do something, you know, the biodiversity situation in Scotland is disastrous.
- The people at the top of the farming industry, and I mean government and industry, they need to get their act together and figure out what they want. It seems to be a complete mess and there is no information, there is no guidance. We don't even know what the future of the single farm payments is going to be in Scotland. We have no idea. So how on earth can you plan for the future. Absolutely no idea what the financial schemes are going to look like.

## ADVICE FOR OTHERS

He recognises that this is the way it is and there is no other way than to keep trying things and learn from your own mistakes.

 I think we just have to keep at it. I will try this spring and early summer to experiment with holistic grazing. But there is still some trepidation because we spent quite a lot of time in the last 20 years restoring some of the wildflowers and old pasture and, you know, to go and trash the place with 150 cows (laughs). It is quite a difficult decision to make when you've spent a lot of money and time doing something else.



# JIM SHANKS

Jim Shanks has a farm near Hawick in the Scottish Borders. Jim's family bought the farm in 1951. He did a Nuffield scholarship to learn more about on-farm energy renewables.

## FARM PROFILE

The farm is just over 500 acres. They milk 175 dairy cows and use their slurry to produce Biogas in a 200-kw plant, and they grow tomatoes in 4 acres of glass houses, powered by woodchip.

## MOTIVATIONS/SUCCESSSES

Jim has always been interested in developing businesses so as not to waste anything and putting everything to best possible use. In the late 2000s the dairy managed to get a good contract and they decided to diversify and make the farm more sustainable going forward by developing renewable energy from agriculture. He did a Nuffield scholarship looking at all types of on-farm renewables in Europe and the USA and his interest has spiralled since.

His family has played a big part in making it work by supporting him.

Business-wise, setting up the glasshouses for tomatoes has been hard work to make it successful. He did a lot of research into it making the biogas, the woodchip and the glasshouse to start up together, all according to his plans and it has worked. They turn out a lot of produce from a small piece of land and receive a lot of visitors to see how it works.

 I started to realise that renewables were not like any other diversification in that they could make a real impact to a business. There was a lot of diversification that didn't make a big impact financially to a business, but I realised that this was something that we could do that was going to be a real gamechanger.

 My parents allowed me to go and make mistakes without leaning over my shoulder saying, 'What the hell are you doing that for, son?' I think that's a fairly big thing. They've always supported me but ... I grew up and realised that I had to take them with me and whatever I did. They leave me to it, but I respect that when there is a big decision to be made, that we all have to travel together.

- The product sells well, and the people want it. We're still milking cows and I think that's a pretty big success as well. The cows do well for us and everything just links in together, but the biggest success, I think I would appreciate probably, is the glass house.

### IMPACT/MEASURING

His supermarket contract obliges him to do a carbon audit for the dairy. But generally, he would want to know in any case that what he is doing is environmentally the right thing to do. He recognises that financial viability has to come first though, as otherwise he could not continue to pay off his debt from his investments into the future.

His business makes sense: they take the methane from the slurry to heat the glasshouse. They use electric also in all vehicles to ensure that all is linked and nothing is wasted.

- So, if it if it makes monetary sense, then it generally tends to make environmental sense because you're not wasting things - those two are well linked.

### WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?

The planning regulations have been the most frustrating, particularly failing to get permission to install turbines despite his ability to create jobs and all sorts of other benefits for the local economy. He finds other bureaucracy also frustrating and now has ended up paying an admin person to manage it.

He is also aware that in the end, the important thing is to keep the price of his products down as generally customers don't care so much about the story behind the products (that they are locally produced and with green energy) and these stories are hard to get through to them. He does have regional support, as he believes that locally people know his farm, appreciate the better taste of his tomatoes, and care about them being locally grown.

- We have a great deal of support locally for tomatoes and we sell them to a limited number of local shops, and they do tremendously well. But then you take a few tomatoes to the Glasgow fruit market and it's a different kettle of fish: nobody wants to know where they're coming from, what the story is, how green they are, all they want to know is how cheap they are. ... it's very difficult. If there's one price for one and one price for another, then the price will wipe the floor every time – price is king every time.

## HOW COULD YOU BE BETTER SUPPORTED?

He thinks he could be better supported to get his message through more widely and getting his story out. By contrast, he feels well supported by other farmers who do similar things and who always seem to be happy to share their experience.

- The farmer will always say 'Yeah, I'll show you everything I'm doing and by the way, someone down the road is doing something that's right up your street, why don't we give them a phone and we head down there?'

## ADVICE FOR OTHERS

He maintains that it really helps if you can work on something that you have natural enthusiasm for, do your homework well, be honest with yourself about the numbers (because anyone can make the numbers work for themselves), and work with people (and your family) rather than against them. He also thinks that there needs to be financial rewards for environmental work as these problems are not going to be sorted without real carrots and sticks.

- You've just got to pick up the phone rather than just expect governments or anything like that to come and give you contacts. The more people you speak to, the more ideas will come in your head.
- Allowing bank managers, family, to challenge you is a very healthy thing, but beforehand I would have seen it as a negative thing. You've got to be able to say, 'Well, if you're going to borrow X amount of money you've got to be able to back yourself up and do it'. Some of the worst-case scenarios have been where nobody's challenged anyone, one person in the business has been allowed to just go off in a certain direction, spend millions and nobody challenged them and then everybody has the pieces to pick up after that.
- All the carbon, all renewables, everything to do with environment, it all comes down to pounds, shillings and pence, and if it doesn't work, the whole thing will fall flat. People are not going to do it to save the planet, they have to be driven in that way. But you can't rely on philanthropists to go and save the world, people have to be encouraged...



# DOUG CHRISTIE

Doug Christie is an agricultologist and member of the Pasture Fed Livestock Association which, he says, has significantly influenced his farming system.

## FARM PROFILE

Durie farm is just outside Leven in Fife. He farms a native breed of cattle, using regenerative methods to improve soil health. There are 570 hectares of which 40-50 is woodland. 200 hectares is organic certified since 2006, roughly half of which is permanent pasture on which he keeps his cow herd, and he grows organic crops. The rest of the land, just over 300 hectares, is in a stock-less arable rotation, growing cereals and legumes and brassicas and linseed and various combinable crops. Nearly all of that land has not been ploughed for 20 years.

## MOTIVATIONS/SUCCESSSES

He started with minimum tilling and direct drilling 20 years ago (scratching the top inches of the soil only) but realised that this alone was not the answer, so started putting in cover crops over winter. His next steps, when his experimentation really took off, was after visiting Frederick Thomas in France, joining Biodiversity, Agriculture, Soil & Environment (BASE) UK in 2011, and visiting the USA in 2014, taking lessons from Gabe Brown, Joel Salatin and Dwane Beck. With direct drilling and cover cropping, his need for chemical inputs is now significantly reduced (using 4-5 litres instead of 30-40 per hectare). He also saves a lot of fuel in the process.

○ As far as establishment costs, ... I thought of why do I need to invert and move to 2000 tonnes a hectare of soil just to get a seedbed, for example, and all the fuel associated with that. Really changed my way of thinking about the whole thing. It is not only cost saving, which is originally why I went down this road, but it ticks so many other boxes: ecoservice benefits of improving soil health, whether it be clean water or carbon sequestration or biodiversity and so on, it does tick all the boxes. ... I don't know if I really like the word regenerative - but it's taken off, and I can quite see why, after going around these farms 6/7 years ago.

○ There's got to be a way round, an easy way around, without having to write cheques for inputs that are not sustainable, whether it be nitrogen fertilisers or fuel or chemicals, because these are just one hit fixes, they'll last for a year, and you've got to do it again the following year.

## IMPACT/MEASURING

He used AgreCalc on the Beef Efficiency Scheme but was not impressed when the top of the list recommendation in the report was to change the lightbulbs in his sheds. He concluded that they ask the wrong questions. He also measures soil health in different ways but says he is still not sure whether his soil has improved as there are many parts to soil health that are all equally important (incl. infiltration, corm count, the food web...). As far as fuel use on the farm, he started recording his use for every operation. After finding that he was using more fuel for his livestock than for his cereals (not counting drying costs), he moved to keeping cattle outside all year round, which has reduced his use of fuel by 1/3. He sees ways of reducing this more by improving his pasture, which takes time.

- I don't think they ask the right questions in the audit. I think they are changing now, but I think it's a very, very blunt tool and I think it could be improved on quite considerably. ...They don't ask whether you direct drill, they don't ask whether you plough or whatever it is in it, so I don't think it gives the full picture.
- It's a complex, very complex issue, soil health, and there's not one parameter that will measure or one measurement that will accurately assess soil health.
- [On fuel use:] there's a long way to go. I reckon I could reduce [my fuel use] to 10 or 15 [litres per hectare] without any problem, but it takes time getting my grasses more adapted to grazing throughout the winter with long rest periods and short grazing periods.

## WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?

He has been experimenting with different crops for companion cropping and, not surprisingly, they have not always been successful (e.g. he has found beans have been more consistent than peas), as he has done a lot of experimenting with different varieties. He is also continuing to experiment with reducing his input of fertilisers. He managed to cut it by 1/3 over the last 5 years by using more legumes as a break crop in the rotation. He has also learned a lot about drainage and soil temperature (the need to shorten the period for soil preparation in autumn, and not to start sowing till later).

- There's so much experimentation I've done on that that I was up for problems, I was well aware there could be problems.

 ...drainage is so important, ... I was cultivating land when it was too wet, ... you've really got to be very careful not to go and work wet soil. Even though you can, you shouldn't. ... because there's not the mineralisation of nitrogen... Also, in the spring, you've got to wait a bit until the soils warm up. It's a bit a bit like, akin to the organic system, you don't rush in there and start sowing ...the soils have not warmed up enough.

### HOW COULD YOU BE BETTER SUPPORTED?

He maintains that food producers should use sustainable practices (that do not need to be subsidised) and they should be rewarded for doing so (rather than subsidised for the use of fuel and chemical inputs that are damaging). In terms of other support, he would like there to be more advice on soil and agri-ecological methods as there is little available out there. He is suspicious of free advice that comes mostly from private companies with commercial agendas but would encourage private finance that is mutually beneficial to farmers and the companies involved (e.g. water companies encouraging farmers to sow cover crops). He is weary of Genetic Engineering as the overall answer to all problems, and recognises that there may be some positives for it but also huge risks.

 I think we've got to get away from being subsidised because a lot of the subsidies are directed in the wrong way and I don't think food should be subsidised. I think natural capital should be subsidised, but food shouldn't. ... I think we've just got to get on and do it. And if your business is not up to scratch, then either sell a farm or change your ways. You can't rely on subsidies. We should not be paid to degrade soil, I think we should be paid to regenerate soil but how that's done, I don't know. ...perhaps diesel fuel should be taxed more, and a true carbon embedded carbon price should be placed on it, as should be on chemicals and synthetic fertilisers. But how you measure that and how you tax that, I don't know.

- I think science has got a bit of catching up to do, but who funds it? At the end of the day, it's not going to be an agrochemical company, is it? So, I think that's probably got to come from the government or financed by farmers, but there probably could be some reluctance there...
- ...water companies are paying farmers down South for putting cover crops in, which is great, really good and I think that's possibly where the funding should come from in the future rather than from the government, because I think the government going forward will have a lot more important ways of spending their money...
- That's what really worries me about GE. People have been saying, oh, this is the answer to everything, we're going to solve all of our problems with genetic engineering. I don't think so. I think we've got to be very careful on the genetic engineering front. There's a lot of positives for it, but yet you got some weaknesses there, there's some threats there as well. Scotland has got such a good name, brand name for its quality produce, I think it could be very dangerous going down this route, because once we lose the brand name of producing quality food, then that's it, it's gone, and it's going to be difficult to get it back.

## ADVICE FOR OTHERS

He has enjoyed a lot of support from farmer-to-farmer groups like BASE, where the discussion is not dominated by non-farmers. He recommends direct observation and asking your own questions about your inputs, especially considering that ideally everybody should be striving for a circular system that works for their own particular context.

- It's so important getting farmer to farmer knowledge out there because it's greatly underestimated, and there's so much experience out there between farmers and with social media and things like that, it's a lot easier.
- I don't think there's a magic bottle fix for the whole problem with biodiversity loss or carbon emissions from farming. I don't think there's a quick fix, and there is certainly not a one size fits all engineering technological fix.
- It's just like our observation of why is that bit of the field yielding higher than the other part of the field? And just a bit of investigation, because you'll be able to see, most of the times, you can see it using your senses, whether your eyes or whatever it is or your nose. If you got really stinking soil than you can think 'That's not right. That's anaerobic. It's not going to grow anything.' ...Question everything you do. Just because you put a certain product onto your land for the last 30 years, do you really need it at the end of the day? Possibly get out and see.



## DEREK ROBESON

Derek Robeson is a consultant for Tweed Forum a consultancy firm who provide ecological services to private and public sector. They have delivered many successful environmental programmes with local farmers and landowners in the Scottish Borders and North Northumberland. Before joining Tweed Forum, Derek spent 15 years as a Senior Conservation Advisor with Borders Farming and Wildlife Advisory Group (FWAG) and worked with Scotland's Rural College. He assists Scottish Borders Council with their Land Use Strategy projects; promotes natural flood management techniques, integrated catchment management and environmentally responsible farming practices.

### FARM PROFILES

The general profiles of the clients he works with in Tweed Forum are arable and mixed farmers, mostly upland, and including large estate holders and a lot of tenant farmers (not so many smallholders). The upland farms often have sheep or sheep and cattle. The Central Borders are generally mixed (sheep, cattle and arable). In the East they tend to be more arable.

### MOTIVATIONS/SUCCESSSES

In his early career 25-30 years ago, nobody mentioned climate change, it was all about biodiversity and conservation. Climate change concerns have come up really fast in the last 10 years, and even more since COVID. Generally, whatever you do for climate change has benefits for wildlife and vice versa, the two go hand in hand. But the current focus is very much on climate and green energy, and he does not think government puts as much value on biodiversity as they should.

His clients are very aware of carbon and their potential for making money with storage, especially with woodland and peatlands, but also potentially around other natural capital and ecosystem services. He reckons we need a template from government on how value is put on these other streams. In terms of funding available, the current theme is forestry, with biodiversity and habitat management not getting as much attention as they should. In terms of farmers' engagement, it is often the case that there are three generations making decisions, and the younger generation is especially driving the environment/climate agenda.



And it's been a massive step change in the last two or three years with Covid. I think it made people realise just what can happen out there and how important the environment is and how important it is to take the environment and the climate, seriously. And it's made people focus their minds.

- How do you put a monetary value against your wildlife habitats, your meadows, your wetlands, your ponds, your field margins, your water margins. It's placing a value on these, which is quite esoteric at the minute. Until we get that from the government, then it becomes easier to do.
- At the minute, it's veering towards forestry, you know, that's where the money tends to be. And which is fine to a point, but it has to be the right tree in the right place at the right scale for forestry... They think forestry is the answer and part of the way it is, but farming, perhaps, and biodiversity and habitat management have maybe been slightly left behind in that argument. We need to redress the balance slightly there I think, you know, trying to get them working together more.
- When you try to change somebody who's in their 60s or 70s into a different way of thinking, it's quite a challenge. It's a huge challenge. So it's a generational thing. I think you got to get to the younger generation as they're much more receptive to what's coming down the line.

### IMPACT/MEASURING

Generally, the measures they put in are not monitored for outcomes. This is just as well because, while they observe benefits, on wildlife etc. over the long term, they often cannot prove exactly that these benefits were the result of recent interventions. Monitoring is more productive if it considers outcomes over a longer term, a generation, and focus on trends. They should also consider regions, the whole water catchment, not individual farms, to see how these can work together on what is needed on that larger scale.

- And if you get paid by results then how is it going to pay? You are going to be paid by the number of lapwing chicks that are reared in these fields, the number of flowers that come as a result of your management change. And that could be so dependent on the weather, on factors beyond your control, so you could do all the right things and yet still the birds don't come or the flowers don't flower, you know, because it's been too cold or too wet or too dry or, you know, or whatever. So there can be a number of reasons why payment by results might not always work.

 If you can get them to work closely together, you know, 20 farms in a catchment looking at water improvement or habitat connectivity, then that is going to work really well.

### **WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?**

A concern is that the advisers often do not understand the full picture as it is really complex. Till recently, there was an effort to carry out integrated schemes that combined forestry, conservation and agri-environment interventions in the same application, but they were too complex. Now these schemes are running separately again. In practice, experts have expertise only in one area and can only advise on one part of the picture.

There is a lot of potential with the new Regional Land Use Partnerships, though how these are carved up geographically needs to be based on land use, it should not be a political decision. How these will function e.g. how they determine their priorities, how their budgets will be split etc. will be very challenging as it is about finding consensus around solving very complex problems between a wide range of stakeholders.

In the end, it means persuading upland sheep farmers to become land managers. Our experience of the Foot & Mouth Disease crisis shows that this is not straightforward.

There is also a real challenge around finding funding for schemes that are often very expensive to implement, and where the farmer does not see direct benefit for their farm. The benefits are often for the wider public and only visible a few miles downstream, and they do not generate a regular income. It is tricky also to find regional strategies that keep everybody happy. There are always trade-offs.

 I think the biggest challenge going forward will be getting the advisers to understand all these complexities, you know, from farming through forestry to conservation, you know, all these things. These people will not look like a one-stop-shop... people need to know to pool all that stuff together because it is quite desperate at the minute, you know.

 If you can get regional schemes, regional targets, regional priorities, regional budgets, that surely has to help because, you know... The borders are always competing with the islands or the highlands or, and they are different farming systems altogether, different priorities, you know.

- So I think there's that concept that hill farmers are businessmen, they are sheep farmers. But in actual fact, what they are is land managers producing a product for market which is quite heavily subsidised. So if the subsidy shifts in a certain way, then you have to shift with it or it's going to be a problem. I think the younger farmers will shift with it but some of the older farmers may just not.
- Back in 2001 when we had the foot and mouth, a lot of tenant farmers were bailed out and some of them could have taken their compensation payment and go. But most of them didn't, they just put sheep back and you think, well, why did they do that? They did it because that's the only lifestyle that they knew. They knew they were making losses before and they were going to make losses going forward again. So it's a lifestyle choice for them. That's the lifestyle that they know.
- If you're managing meadows or wetlands or whatever is or storing carbon or increasing wild birds, then you need an annual income from that. And that's where we are at. How do you get an annual income off a fixed area, a geographic area, which is a farm? That's where Natural Capital and Ecosystem Services discussion will grow in the future. It does seem that there's a disconnect between upstream and downstream folks. If the benefits are down there, then the costs are up here. How do we link the two?
- How to keep the arable farmers happy along with the mixed farmers, along with upland sheep farmers and the foresters? Well, the truth is you can't. There are going to be trade-offs and these will be painful for some.

## HOW COULD YOU BE BETTER SUPPORTED?

There is a lot of information out there that is way too much to digest and also not easy to make sense of without a specialist advisor. What would help is a steer from the top to determine the general direction of what we should be doing. That is then translated into detailed plans funded at regional level and informed by grassroots who work out how they are implemented on the ground.

Additionally, to respect soil health, which is fundamental to all of this work, we need to intervene at the best times of the year. Funding for these schemes therefore needs longer timespans so that the interventions can be timed right.

-  You've got an inbox full of stuff that you should be reading, but you have to cherry-pick because there's so much of it. And from a farmer's perspective, they've got to go to an adviser to make sense of it very often. So, yeah, it's really not easy.
-  But it can't come just from the top. It has to be a top-down and bottom-up approach. There have to be government policies up there, but the guys on the ground need to work out how to do it, basically.
-  You know, we know we're doing things at the wrong time of the year. The money has to be spent and cleared by the end of March, right. We know we are damaging the soil. We know we're not doing it right but we have no choice. The two most important things on the farm, you know, are soils and water. And you get that right, then you're pretty much there, but you get it wrong and all sorts of problems will stem from compaction and all of that.



# DENISE WALTON

Denise farms at Peelham Farm in the Scottish borders, in Southeast Berwickshire with her family. Her background is in ecological land management, and her husband's is in agricultural economics which explains their interest in agroecology/climate change and biodiversity from the beginning. Both were new entrants to farming themselves but both had grandparents who farmed.

## FARM PROFILE

Peelham is about 2 miles from the coast, located on a watershed between the Tweed and the Eye Valleys at about 700 feet. Geologically it is an outlier of the Cheviots and the Lammermuirs, which makes the land semi-marginal. The farm is 650 acres and has been farmed both organically and with Pasture for Life certification since 2005. It is primarily a livestock farm and the only cereals they currently grow are crop for their cattle. There is an on-farm butchery, that enables them to sell their meat (beef, pork and lamb) direct to the end user, and that's also organic and Pasture for Life certified.

## EARLY SUCCESSES/MOTIVATIONS

They have been members of the Pasture for Life Association for years. When the CAP reform brought organic farming up the agenda in the early 2000s, that made it possible to carry through their plans to get rid of their dependence on agrochemicals and become certified organic. Since then they have also become pasture-fed only (no grains are fed to their ruminants), which was another big step in terms of their carbon management. More recently, their son has become a partner in their business which has energised their plans around climate change initiatives again.



We've been farming here for 30 years, but in terms of our passion, it's definitely energised by the sense of our son, who's equally passionate. You can imagine what the discussions are in our family around the kitchen table about issues of climate change. So yes, succession is a really important part of that.

## IMPACT /MEASURING

They started using carbon cutting tools and entered into a series of interventions producing on-farm reports by Scottish Agricultural College (SAC). Following a disappointing report from the Farm Advisory Service using the AgreCalc audit, they have recently started using the Farm Carbon Cutting Toolkit (FCCT), 'made by farmers for farmers', to measure their emissions (no results worth reporting yet to date). The SAC interventions included strengthening their sequestering capacity by increasing their woodland to 40 acres, hedge planting and other habitat restoration.

They have recently been trying minimum / no till but with limited success. This is mainly due to their soil's properties, but they think perhaps there is more potential with better equipment in future.

As one measure towards reducing their use of plastic, they are planning to build a silage pit to reduce the amount used in silage wraps.

 I wasn't that impressed by AgreCalc and I wasn't that impressed by the FAS report. I just felt that I wasn't that convinced by the metrics they use, so we are now using the farm carbon cutting tool kit, made by farmers for farmers.

 We've reduced the amount of our arable anyway, and we're leaving grass in for longer so we're not having to plough as much. But no till so far - or minimum tillage - hasn't been as successful as we had hoped, but we're working on it.

## HOW COULD YOU BE BETTER SUPPORTED?

Denise maintains that every farmer should be measuring and managing their carbon. To facilitate and encourage this, there needs to be clear information on how to do this, effective tools for this, and guidance on the methods that can be used for emission reductions. Alongside this, clear information is also needed on carbon trading, with focused support on how to assess and measure on-farm carbon.

Similarly, farmers should have access to a farmer-friendly biodiversity measuring toolkit to assess their farm's biodiversity resilience. In terms of funding, more agri-environmental schemes should make available more funding to encourage everybody to improve their biodiversity and carbon sequestering habitat infrastructure, particularly, for example for planting hedgerows, which can be really effective.

- So, every single farmer in Scotland should get information on how they measure it and how they manage it. I mean, there's something ridiculous, like over 50 different carbon measuring kits or methods out there – which one should we be using?, which is the one that is going to provide comparable results?, and so I think that's really important.
- Also, we need some clarity on carbon trading. I'm part of a WhatsApp group which actually looks at carbon trading for farmers and the information is all over the place - there's so much uncertainty and not enough information.
- Biodiversity is actually at the core of the climate crisis ... We've been degrading ecosystems on our farms for decades and the ecosystem functionality of our farms is in a really bad state, so we need to be as aware of the biodiversity resilience of our farms as well as the carbon resilience of our farms. So, we need direct on farm assessments to measure and manage both, and it's easily done.

### **WHAT HAS NOT WORKED/IS FRUSTRATING/ CONCERNS?**

They are especially frustrated by the attitude of other farmers, particularly younger farmers, who don't seem to be open to issues around climate crisis and biodiversity loss.

- ...certainly, young farmers of my son's age - and he's in his mid-30s – are just being extraordinarily blind and deaf to the issues of climate crisis, the biodiversity crisis, but still looking over the fence at us. We produce beef very well and we're doing 500 kilos liveweight gain within 19 months just on grass, and we're semi marginal, so we can demonstrate that actually you can farm with carbon management in mind and farm perfectly profitably.

## ADVICE FOR OTHERS

Denise thinks we need to take stock of the damage agriculture has done and shift the mindset to become part of the solution. It has already been shown how we can farm profitably whilst respecting nature and climate pressures. The unions and the food & drink /meat industry need to develop strong leadership in this, stop encouraging old practice, and show the way forward on this.



We can farm profitably by farming for the climate and with biodiversity and it is possible, it's been demonstrated. Farming for biodiversity is not a dead end. We've got to also shift the mindset from productivity at all costs to profitability management, to profit margin management. We can reduce costs by reducing agrichemical dependence, so it's just so important – really, really important.



# ANDREW BARBOUR

Andrew Barbour runs a livestock enterprise with his wife and family in Highland Perthshire. He also has experience in forestry, deer management and aquaculture. He was recently Acting chair of the Deer Working Group.

## FARM PROFILE

Andrew describes his farm as a grass clover farm that's run on agroecological principles. He made a conscious decision to do so in the early 2000's. His practice includes planting clover to replace Nitrogen input, not ploughing, rotational grazing, side stepping the production of straw by pasture cropping, monitoring efficiencies in his stock to manage a cull policy.

## MOTIVATIONS/SUCCESSSES

He was working in marine environments as a professional biologist where they worked with phosphates on a daily basis. He became fully aware of the damage done by fertilisers to the habitat on his own farm, particularly the enrichment problems they were causing in fresh water, which made him look into issues around the use of Nitrogen on his own farm.

Alongside climate concerns, he is driven by economic concerns as well as moral standards for animal health and welfare. He recognises that these go together and that the farm is now in a much better state than where it was 25 years ago. This is evident from things like having no algal bloom, coccidiosis is no longer a problem, and they have good reproductive success with ease of calving.

○ There's enough information available to show that on a more extensive system you could do a world of good to not use Nitrogen. A more intensive farming model has real health and welfare issues, causing animal welfare and environmental issues, with algal blooms in the loch and so on. You didn't have to be a genius to see we needed to redesign to still be in business.

○ A healthy animal makes money for you. It's measured also in terms of biodiversity values on the farm. It sounds sentimental but you can tell a happy farm.

## IMPACT /MEASURING

He uses a carbon calculator but finds the results disappointing as it does not tell him enough about which of his practices contribute to the overall outcomes and how productive they are relatively. He recognises that there are currently no better tools.

He also does a benchmarking exercise to record biodiversity on his farm annually as he maintains that the success of a farm is measured by its biodiversity values.

He would also like to make better use of electrical identification (EID) systems but recognises that this is costly and with his lambing taking place outside, performance tracing is challenging anyway.

 I was hoping the carbon calculator toolkit would show me the importance of our different decisions but it being a black box tool you don't see the workings. Not sure if using clover instead of N, not ploughing or rotational grazing. Not sure which is more important in terms of keeping and building soil carbon. I know what sticking trees in the ground does but can't tell you which is most net benefit Efficiencies in stock. We have a cull policy which is important but can't say which is most net benefit.

## WHAT HAS NOT WORKED/IS FRUSTRATING/ CONCERNS?

He is trialling lots of different practices which do not always give good results e.g. he is constantly challenged by his sheep getting through his electric fencing when he tries to introduce rotational grazing.

 Got to try different things. I've not found it easy using temporary electric fencing with sheep because sheep like to eat the electric fence equipment. But we do keep the sheep on the move regularly. I don't think sheep and rotational grazing works well with sheep. Always some animal shorts the fence. Is there a real issue about the way that sheep graze – they are so selective in that kind of mob stock and move system. They don't work as well as cattle. Their grazing patterns are different. Cattle are naturally good at it.

## HOW COULD YOU BE BETTER SUPPORTED?

He feels that too often the approach is to find problems and catch farmers out. Instead, he welcomes more constructive and positive on-farm discussions around practical solutions.

In terms of the support that is lacking, he would welcome support for making better use of EID as he cannot justify the expense despite the 50% grants that are available.

He mentions that fencing is one of the less visible costs on many farms that could be supported for the sheep sector to encourage rotational grazing.

He is also frustrated by the lack of support for agroforestry. Additional support would enable him to build on what he has been trialling.

 One thing I would appreciate is if people coming on to the farm came on to try and discuss ways to do things better rather than find problems. Would be nice to find support from people that want to help you with the running of the business rather than catch you out.

 One of the most significant costs on farms is fencing, many people don't see it. Ties up an awful lot of capital. Real weakness in the sheep sector is the high cost of fencing.

## ADVICE FOR OTHERS

He reckons that every farmer needs to take the challenge of adapting their practices to net zero seriously as banks and customers will want to know for sure about overall costs and carbon performance. The challenges of meeting net zero targets are being fought out between different sectors just now, and he is concerned especially about how High Nature Value farming systems will come out of this.

 If you aren't looking at this now, you'd better be prepared for trouble. You will be looking at business failure. I just hope that the farming world gets treated in a fair way.



# AILSA CURRIE (+ ADVISOR ALEXANDER PIRIE)

## FARM PROFILE

Ailsa runs Bellevue Farm on Arran where she keeps beef and sheep on about 250 hectares and grows cereals more intensively alongside for optimal yields.

## MOTIVATIONS/SUCCESSSES

Ailsa describes her interest in climate change and the environment as something that has always been there and practised in the way they were taught by previous generations to look after wildlife and the birds as they farmed. Actual awareness of climate change, and taking responsibility for that, has come about more recently, roughly in the last 5 years. An example of policy around these considerations that came to life on the farm was the Beef Efficiency scheme that helped them look at maximising productivity as a way of being sensitive to climate concerns.

○ It was just sort of a subconscious respect for nature that you were kind of brought up with. It would be leaving little areas at the sides of fields for the beetles or whatever. That was something that we were always taught and you watched out for your birds, you tried to look after them. But that was just a sort of traditional thing that always happened. It's become a more formal identified kind of thing, if that makes sense. Ailsa

## IMPACT/MEASURING

A group of farmers on Arran noticed that their outputs were going down and yet their use of fertilisers was comparatively high in comparison to standards across Scotland. As a group they were trying to cut their costs particularly from reducing lime input. They since started looking at their fertiliser management and had soil samples taken, and are now trying to improve their pH more deliberately by looking at inputs (rather than blanket spreading).

○ And it's probably just with the benchmarking group that's really brought to the front. That you know, you think you're saving money, but it's probably costing you money. Ailsa

## WHAT HAS NOT WORKED?/ FRUSTRATIONS/CONCERNS?

She sees it as a process of taking on board and understanding information and finding ways to make their farm work more sustainably and yet without compromising its overall efficiency. They cannot afford to go off on a tangent, as they have to keep paying their bills and the margins are really small. She feels that having both the livestock and cereals has helped the farm's resilience. Unlike all-arable farms, where there is no grazing for livestock, a mixed system allows for making efficiency improvements and carbon savings in different areas, and take on measures that protect biodiversity at the same time. Her concern is that a farm that is low on carbon emissions is not necessarily the best for biodiversity and vice versa.

They did carbon audits but they did them at an early stage in their journey. The drawback is that they did them perhaps too early on in their process, when they did not yet fully understand what was involved. However, she recognises how valuable the audits have been and will recommend them to others though she can also see their cost being prohibitive to some.

 The two, we can't go completely off on a tangent one way because we've got to make a living and pay our bills to keep us here. So, you know, that's where we're really trying to get the two to pull together. You know to run the business, but I do think we are learning that that is doable. Ailsa

## HOW COULD YOU BE BETTER SUPPORTED?

The Arran group has benefitted a lot from a specialist advisor who was briefed in advance on local regional information and key performance indicators of the group members so they tailored their advice. Together with the audits from time to time, this has been really helpful for better understanding what is going on.

 And a lot of people wouldn't be keen, you know, just now to pay for that because it's another expense and everything seems to be going up in price at the minute. And, you know, you're looking to see what you can cut back that you can do without it. But I think that is a good way of, you know, if you've got these figures in front of us or looking back on last year, we're looking at comparative figures for the island, for Scotland. And, you know, I think that is a good way to keep monitoring your progress and see where were going. Ailsa

 When you have cumulative audits, you can look and see, oh, well, that's the year I did that. And that's the impact that it had. There's that built in kind of knowledge exchange with yourself and that's really good. So, yeah, I do think going forward carbon auditing will be good for a lot of folks. Alec

### ADVICE FOR OTHERS

Ailsa listens to everything she hears and tries to keep an open mind. It is clear that the national discussion has shifted from a view that we need to reduce livestock numbers to a view that there is a role for ruminants too. That the situation is complex, and we are only still developing our understanding of what is required for both climate change to be contained and nature to thrive at the same time.

 Basically it's listening to everything you're told and keeping their mind open to taking in any new information or ideas. And just try and keep up to date with it all.

 I think that we're probably on the cusp of a really interesting discussion ... You know, we could cut emissions across Scotland greatly if we reduced stock numbers. But obviously there are impacts to that. I think that we're getting into the nuances of the situation. And there is the idea that a climate efficient farm, a farm with a low carbon footprint and a farm that's running efficiently may not be particularly good for biodiversity. So I think that, yeah, we're investigating a lot. We have identified some conflicts. There is some really good stuff to come down the line. Alec