

Ear to the Ground Podcast Transcript

Episode 28 - Managing upland pasture for economic and environmental benefits

Aled: Hello and welcome to Ear to the Ground – the agricultural podcast brought to you by Farming Connect. I'm your host, Aled Jones and thank you for tuning in. We aim to bring you a new episode of this podcast every fortnight so please make sure you subscribe whether that's via Apple, Spotify, Google or any other platform to ensure you stay up to date with all the latest episodes. Well today I'm joined by Dr Non Williams, who works for Farming Connect as a red meat technical officer. Non, welcome. Now before we dive in to talk about your role as a technical officer perhaps you could explain to our listeners a bit about yourself and your background.

Non: Yes, that's it. So, as you mentioned Aled, I'm Non, I'm from Anglesey up in North Wales, from an agricultural background. However, my parents didn't actually farm so agriculture skipped a generation in our family, however, my grandparents were farmers. So I was brought up on a smallholding on Anglesey, and attended university at Bangor and studied agriculture, conservation and environment as BSc before going on to study for a PhD, also at Bangor University. I'm a very active member of the Young Farmers organisation, both on county and Wales level and enjoy taking part in all sorts of activities as part of being a member of the organisation.

Aled: So, a very busy person indeed and what comes to mind is how on earth do you fit it all in? But it's great to have you on the podcast Non and it's great to hear that you've recently joined the team at Farming Connect as a red meat technical officer. What exactly is involved in that role and what are your main areas of work?

Non: Yes, that's it. I very recently joined as the red meat technical officer for North Wales, so enjoying working as part of the red meat team across Wales, working specifically with demonstration sites and focus sites developing projects which are of benefit to farmers as well as the wider agricultural community. So developing the projects, looking at the findings and the time to exchange knowledge across the sector itself is the main aim of the work, but as I said, working as part of the red meat team across Wales and developing different projects, different events and so forth.

Aled: And I know it's a very interesting role indeed and we'll have a chance later on in the podcast to talk a bit about where you go from here and the things you've got planned. But you've brought a lot of expertise and knowledge to the Farming Connect team because you've recently completed a PhD as you mentioned earlier hence your title as Dr Non Williams. So firstly, I must congratulate you on completing your thesis. I'm sure it took a lot of time, energy and dedication which followed no doubt by a huge sense of relief when it was all finished.

Non: Yes, definitely as I was writing up during the beginning of the lockdown period this year. Of course, with everything cancelled there was no excuse not to get the write up done, so yes, very happy to have passed the *viva* with minor corrections about a month ago now.

Aled: Well that's brilliant and the title of your thesis was the environmental cost benefits of improving pasture productivity on upland cattle systems. Now, why did you choose that title and topic to study?

Non: Well as I mentioned previously, I studied an agriculture conservation and environment degree at Bangor University and as part of my third year on this project in that year, I got an opportunity to do quite a lot of fieldwork working on Defra sustainable intensification project. Some of the listeners might be aware of that project. So, I had some sort of idea in terms of where I'd like to go next and really enjoyed doing the field work, having data analysis as part of that work at Prifysgol Bangor. And then on graduation the opportunity arose to study for a PhD. So, this was the PhD funded through the KESS (Knowledge Economy Skills Scholarships) 2 scheme working with Hybu Cig Cymru. Although I had a brief at the beginning of the PhD, obviously development during the course the PhD led to the final title.

Aled: So tell us a bit more about why you thought it was important to study this topic?

Non: Yes. As you mentioned in terms of the PhD title, I focused on upland livestock systems but particularly cattle systems. The reasoning behind this was the fact that we know here in Wales we've got a lot of upland. A large proportion of the country is classified as uplands, obviously not as relevant here on Anglesey but still, the majority of this land is managed for livestock production so this is the dominant land use in the upland. That was the reasoning behind focusing on the uplands. In terms of cattle systems, well from an academic perspective anyway, a lot of the research that has been conducted looking at upland livestock systems either focus on sheep systems or mixed grazing systems. So, I was interested in looking specifically at cattle systems alone. And in terms of the environmental aspect of the work, well we hear on a daily basis about the environmental pressure that red meat sector is faced with, with livestock production of course being large a contributor as we know to greenhouse gas production. So, this is why I took the approach to look specifically at the environment impact from an upland perspective.

Aled: So, in essence you were looking at ways in which by improving the productivity of pastures in grasslands, and indeed, the knock on implications of cattle systems in the uplands, whether that had a negative impact on the environment and to what extent could that be offset and the trade-off surrounding that. How did you go about conducting the research?

Non: Yes that's it, and we know grass is the cheapest form of readily available feed but is often undervalued as a resource. We know, as I've previously mentioned, that there are greenhouse gas production associated with livestock systems, however, on the flip side there's also the sequestration side of things. So, I was looking specifically at the use of grazing systems in the uplands and how we could improve pasture productivity and utilisation, but with an aim to also decrease greenhouse gas emissions or to assess the

impact of improving pasture productivity on the environmental aspect. So in terms of how I went about doing this, I conducted a field experiment at Henfaes research centre. This is Prifysgol Bangor's research farm located in Abergwyngregyn. And it's a great farm to work at because you've got all different sorts of field, soil properties and the topography. The land goes literally from the sea up to the mountain. As I mentioned, I was working in the uplands, the Ffridd land and added some two field experiment over three years up at the top of the Ffridd at Henfaes.

Aled: So, what exactly were the trials you were conducting at Henfaes?

Non: So, the first trial was a three year trial which was looking at various field operations and the effect of those on pasture productivity. I was looking at five different field operations particularly so the first being unimproved grassland, so just unimproved pasture. The second was looking at the effect of bringing in forage crop as a brake crop prior to reseeding with the new grass variety. The third and fourth were very similar. In those I reseeded the land with new grass variety which was specifically for marginal land. However, I compared the effect of ploughing and rotavating prior to reseeding. And the fifth intervention of field operation, that I looked specifically at, was just including additional lime and fertiliser application to the current pasture. So not just to compare the effect of different operations on pasture produced but also to look at the greenhouse gas emissions that were produced following the intervention, cultivations and so forth.

Aled: And with the productivity of other pastures, how were you measuring that? Was that purely volume of grass growth or the quality of the grass as well?

Non: Yes both, so I was using a plate meter to measure the grass height, of course, to have the biomass value in terms of the grass and that was done on a weekly basis. Also, I was taking sward cuts for analysis to look at the sward quality as well.

Aled: And in terms of the five interventions you mentioned, how variable were the environmental consequences of each?

Non: Yes so as I mentioned I looked specifically at the greenhouse gas emissions and mostly nitrous oxide emissions because of the fact that it's a very powerful gas. The treatments implemented did have significant impact on the nitrous oxide emissions, with high emissions from the treatment that were rotavated and ploughed. However, the pasture productivity was also a lot higher from these treatments. So it's a trade-off really of the environmental cost but also the economic cost in terms of the farm itself. But what was quite interesting was I also monitored the carbon dioxide emissions post cultivation just to see the effect of ploughing and rotavating on the emissions produced. I didn't see a significant difference in terms of the carbon dioxide released from the soil which is possibly quite unexpected from that point of view, so less of an environmental cost in terms of the carbon dioxide as opposed to the nitrous oxide over a longer period of time.

Aled: And as you say the nitrous oxide is the most damaging of the gasses and it takes that much longer to re-eradicate it from the atmosphere, so your study very much focused on that as the principle emission that you're trying to minimise?

Non: Yes, that's it, so I focused on the nitrous oxide emission as it is a powerful gas and like you mentioned it's also a very long-lived gas as it remains in the atmosphere for over hundred years. Despite methane actually making up the largest proportion of a sheep or beef's carbon footprint, research has suggested that methane breaks down in the atmosphere within about twelve years or so. So, for example the methane emitted today, by enteric inflammation by a cow for example, would remain in the atmosphere for a decade or so whereas the nitrous oxide produced today would remain in the atmosphere for over hundred years. And also the global warming potential, as I mentioned, it's a powerful gas, so the global warming potential is between 260 and 298 times that of carbon dioxide, so every unit of nitrous oxide produced is a lot more powerful than the other greenhouse gases.

Aled: Interesting to pick up on some of the outcomes of your study and clearly you saw quite a difference in grass growth between improved and unimproved grassland which you'd expect to see of course, but what was potentially more surprising in your findings was that you did not notice any significant differences in the daily liveweight gain between the cattle who were on improved pasture compared to those who were on non-improved pasture, now that's quite unexpected?

Non: Yes that's it, that was the second field trial at Henfaes, which was then looking at implementing the results from the first trial and assessing cattle liveweight gain from improved and unimproved upland pasture. We didn't reseed the land in terms of the improved pasture, we just applied lime and fertiliser, so if I wanted to take this experiment further it would have been interesting to reseed the land and then to look at the productivity from that view point. But yes, as you mentioned we didn't see a difference in the daily liveweight gain between the treatments. So, this implied that there was adequate grass produced from the unimproved pasture to increase cattle performance. So, I know previous research has shown that additional inputs won't necessarily improve productivity without reseeding, so as I mentioned, it would have been really interesting as a follow on experiment possibly, to look at the effect of bringing in reseeding as well as the lime and fertiliser and to look at the effect of that on livestock performance. But yes, this just goes to show that unimproved pasture can lead to productivity gains if appropriately managed. Pasture really should be improved if required but this will only be valuable if it delivers the productivity benefit which will then weigh out the economic and environmental costs. Of course, here I'm talking about the land I was working with, the Ffridd at Henfaes, which was an accessible site and reseeding isn't always possible in upland areas but I was just researching into the options and the environmental cost as well as the productivity in terms of this.

Aled: Did your research consider the differences between stocking densities? For example, you mentioned that there wasn't that much difference in the productivity between improved and non-improved but could improved land carry a higher stocking density and therefore produce more in that respect?

Non: Yes. I was very fortunate to be working on this project at Henfaes as the University farm has not had any cattle grazing the land for over fifty years, I think since the 1970's. So

this was rather new in terms of we weren't quite sure how the land would respond to cattle grazing as opposed to sheep grazing. So as part of this work, I did one year of trial work just to look specifically at the stocking densities and in this year, I stocked the improved treatment at a higher stocking density than the unimproved, so the improved treatment I think was double the unimproved treatment. Just to see how the pasture, if there was adequate pasture for the duration of the grazing system. What we found in that trial year was that in fact there was plenty of pasture within the unimproved treatment and therefore we could actually sustain a higher stocking density from the unimproved pasture. We did take that into account but in terms of the results of the daily liveweight gain, this was measured in terms of kilogramme per hectare of beef produced so looking at it on a per hectare basis.

Aled: And what would you say are the key things that you've learnt that are useful for practical farmers to know and implement on their farms?

Non: So, one of the key messages from this work was that reseeding led to improved grass production, however, it also led to increased nitrous oxide emissions. So this is very much on an individual farm basis. What I think of the key messages are here for farmers would be to really be precise in terms of the inputs, so to make full use of lime and fertiliser applied, to conduct regular soil testing to really look at the soil properties and to apply accordingly. That's one thing I found from my research actually looking at previously unimproved land was the fact that there was great variation in pH within one field which just goes to show that a blanket approach is possibly not the way forward in terms of farm efficiency. And there is also a need to be careful and to consider the wider potential greenhouse gases that are associated with lime and fertiliser. For example, the greenhouse gas emissions that are produced during the production of fertiliser, so elsewhere not necessarily the environmental cost of applying on the farm but we're looking at the whole supply chain and the greenhouse gasses produced elsewhere that also contributes to the farm. One of the other key messages as we've discussed today was that unimproved pasture can lead to productivity gains if appropriately managed, and this is really interesting so it just goes to show that pasture should be improved if required, but this will only be valuable if it delivers the productivity benefits. So, if it does deliver on the pasture production side of things and then in terms of the liveweight gain achieved, this can then weigh out possibly the environmental cost, so it's very much a trade-off between the economic and the environmental costs.

Aled: And it goes once again to highlight the need to look at these things in the ground and see the bigger picture because agriculture does absorb as well as emitting emissions. You need to look at these systems not only focusing on one small intervention and look at the cost of that, and if that does lead then to an overall benefit when you look at the animals are finished earlier and live shorter lives and possibly you can then justify it as a packaged approach.

Non: Exactly, so some of the work I conducted was just some of the methods to achieve or increase the farm efficiency, so just some of the ways that this could be implemented on farms and often enough they all interlink together in a way in terms of improving animal

health, genetics and diet. They all come together in some ways so my research was just looking at one aspect, however it's very much as you mentioned needing to look at the whole picture.

Aled: And I know in doing your PhD one of your supervisors was Dr Prysor Williams from Bangor University and coincidentally Prysor was on episode 27 of our podcast talking about how agriculture needs the environment and how the environment needs agriculture. Would you say that your study and research reinforced that notion that you can achieve both economic and environmental benefits at the same time?

Non: Yes, definitely because I think the work has highlighted that. There are opportunities for these win-wins in terms of the environment and the farm's economic aspect in terms of improving production efficiency, and this could mean intensifying production in a sustainable manner in some areas to release land elsewhere for another purpose. It could mean bringing in agroforestry systems, so it just goes to show that the industry will need to continue to be proactive going forward in the future and I just hope that my work has contributed to the growing evidence base around potential production as well as the environmental aspect of livestock systems.

Aled: And I guess it also supports the need for us to move away from the trap sometimes people fall into by thinking that intensification or improved productivity automatically has a direct negative impact on the environment, but as your study shows that's not always the case.

Non: Yes and some of the listeners might have heard of the sustainable intensification concept which is quite often discussed by policy makers, by the media and so forth, and as you said there, intensification is not necessarily bad for the environment all of the time. Of course, it's a way of doing it sustainably, but also as I mentioned there, it could mean intensifying production in a sustainable manner in some areas which then would allow for other areas of land to be managed differently, so possibly for a different land use or multiple land use such as agroforestry systems.

Aled: And those decisions can be made on a farm level can't they because farmers might decide that certain parts of the farm are better suited towards more productive farming whereas other more marginal land perhaps might be dedicated towards environmental and sustainability goals.

Non: Yes exactly, because all farmers will know their fields very well and will possibly be able to identify the fields that perform really well and some of those that don't. And going forward and thinking about future agri-environment schemes and future payments and so forth, farmers may well be considering looking at the system from different viewpoints and really identifying areas where these sorts of measures could be implemented on farm.

Aled: And I know that your study focused on upland systems, but would you say that your findings are still relevant to other pasture-based livestock systems?

Non: Yes definitely, I think that the key aims of this study is very much relevant to other livestock systems, so despite the fact that I conducted this research in the uplands, I think

that the findings are relevant to all pasture-based livestock systems. We've mentioned the input of fertiliser and lime inputs and reseeding, and the fact that some upland areas have been very difficult to actually be able to get there to reseed the land. So it's the same principle in terms of other livestock systems, being a lowland system or a sheep system, so I hope that even though as I said I've concentrated on upland cattle systems the principles are the same in terms of the role of grassed pastures within agriculture as well as the livestock perspective.

Aled: And as a final question then Non, what's going to be your main focus now over the next coming weeks and months in your role as a red meat technical officer? I know that it's a strange time to be starting a new role given the restrictions on our movements and gatherings but how are you managing to adjust to the circumstances?

Non: Yes so it has been very strange to start a new role from home, however I feel that I am getting to grips now with the work and the way of working now. Of course, zoom meetings are very popular and regular meetings with the team and of course working with the red meat team and the wider team at Farming Connect to develop the digital webinars and so forth. So obviously all of the on-farm events that would usually be held have transitioned to a digital platform so there's a full programme of webinars going on at the moment and planned ahead for the coming months. So, I'm working with the demonstration sites at the moment, to develop projects, to collect some more data, to analyse the data, to interpretate it and to look at it at the farm scale but also hopefully to be of benefit to other farmers.

Aled: Well thank you, thank you Non for sharing an insight into your work and for highlighting some of your study findings on what is a very timely topic of climate friendly farming.

Well that's it for this episode, we'll be back in two weeks' time with plenty more, but in the meantime don't forget to subscribe on whichever platform you use to keep notified of all the new episodes of Ear to the Ground. So on behalf of the team at Farming Connect and myself Aled Jones, thank you for listening and goodbye for now.