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**Sir William Roberts Centre
for Sustainable Land Use
Newsletter
Autumn 2022**



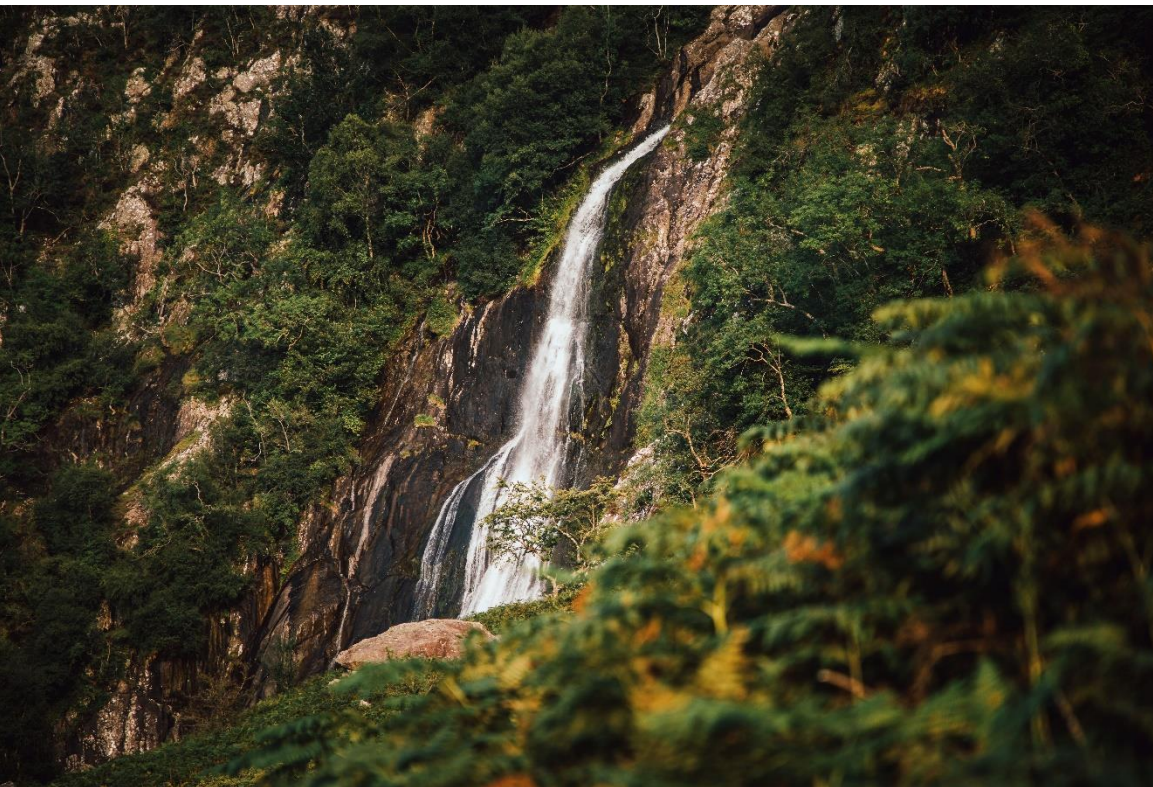


WELCOME



From Theresa Bodner, Doctoral Researcher,
Sir William Roberts Centre

AUTUMN 2022
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“Welcome to the Autumn 2022 edition of *Cynnal-Sustain!* The [Sir William Roberts Centre](#) continues to bring together researchers engaging with sustainable land use across a range of disciplines and domains. We hope you enjoy exploring some of the exciting work being done in these areas by scholars across our university.

A currently critical land use debate focuses on the desirability of woodland expansion in the UK. British woodlands provide a variety of ‘ecosystem services’ - that is benefits to people - from recreation and flood prevention to carbon sequestration and timber production. However, only 13% of Britain is covered with woodland or forests and there is a pronounced drive for this to increase. Calls have been made for as much as 30,000 ha of new woodland a year, including as a contribution to meeting ‘Net Zero’ targets. The British landscape is, however, a cultural and ‘crowded’ one. Where models and policies see space for trees, local stakeholders see existing land uses that are culturally important and already provide a range of benefits. Fitting many thousands of hectares of new woodland into this landscape will be no easy feat.

I have been exploring these issues through my doctoral research with the SWRC. I investigated how opportunities are emerging for native woodland expansion in Britain. Given that woodlands today must provide more (diverse) benefits than ever before, and must do so in this ‘crowded’ landscape, an over-reliance on national woodland expansion targets is ill-advised until key trade-offs are sufficiently understood and ways found to address them. The complexity of woodland expansion drivers also offers new possibilities, such as via natural colonisation. My research has found that natural colonisation can actually unlock areas where active planting is not suitable. Moreover, in some ways unintended natural colonisation circumvents some barriers that hinder other, more active, approaches to woodland expansion. While it cannot yet be found on any available spatial datasets, natural colonisation is widespread and should be facilitated as a valid approach to 21st century woodland expansion.

In the rest of this issue we bring you news of research at Bangor into changing narratives of landscape, the coverage of tree planting within the farming press, deer management, and engagement with nature for wellbeing.”



Theresa Bodner,
Doctoral Researcher,
Sir William Roberts
Centre



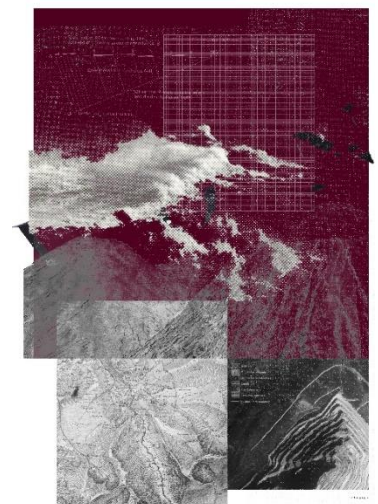
REFRAMING WALES: TOWARDS AN UNDERSTANDING OF LANDSCAPES AS PLACES OF CHANGE RATHER THAN STASIS

'This is the decisive decade' states Welsh Government. Natural Resources Wales warns that climate change is projected to increase the frequency and intensity of droughts, river and coastal floods and heatwaves. The UK Climate Change Committee advises that transforming land is one of four key areas in which action can be taken in Wales to reach 'Net Zero'. It's clear that the landscapes we know, the places we dwell in, are changing and will continue to do so. This knowledge sits alongside an increasing awareness that local voices need to be heard and better understood when it comes to decision-making and policy responses to climate change. For example, in a [study](#) of Australian society Juliet Pietsch and Ian McAlister pointed out that 'public opinion, in advanced democracies, is a key element in developing an appropriate policy response to mitigate climate change.'. The Welsh Government calls for every citizen, community, group and business in Wales to embed the climate emergency in the way they think, work, play and travel. However, it has been recognised that there is a lack of rigorous UK-specific research into public attitudes towards ecosystem and landscape change, and a [literature review](#) of the UK public's perception of climate risk and adaptation found that there were 'no UK studies examining the role of place attachment in support for climate change adaptation' at that time.

In order to begin to address this gap, Alex Ioannou is undertaking a doctoral research project supported by the [Institute for the Study of Welsh Estates](#) and the [Sir William Roberts Centre](#). He aims to shine a light on the dominant narratives which frame landscape in the Welsh collective subjectivity, to articulate them and then to challenge them. Focusing on case study areas located within the boundaries of the historic Penrhyn estate the project will attempt to answer two critical questions: (i) Could, by placing current discussions about landscape change within their historical context and by providing a survey of alternative frames, cultivate new relationships with landscape?; (ii) Is there capacity for a more democratic approach to landscape decision-making which, will help develop a better land use change decision-making framework and support place-based delivery in Wales?



From the outset this project, funded by the Drapers' Company, was developed as a cross-disciplinary exploration which enables the use of methodologies for data collection which bridge the School of Natural Sciences and the School of History, Law and Social Sciences. The project also aspires to process and represent work in ways that lie beyond the discrete boundaries of the Schools by engaging with approaches such as collage, poetic transcription and zines.





NEWS IN BRIEF



The first output from a newly formed collaborative research link between researchers at the Sir Williams Roberts Centre and NUI Galway has just been published in the *Journal of Cleaner Production*. Led by Ashley Hardaker the team have published a [paper](#) presenting a potential methodological framework for integrating ecosystem service impacts as indicator in life cycle assessment. The method would allow for broader evaluation of the sustainability of production systems and to account for how production might damage or enhance the provision of ecosystem service that underpin the well-being of society.

Bangor University researchers have had successes within the UKRI 'Future of UK Treescapes' programme, underlining Bangor's long-standing status within the forestry sector. Following on from Dr Andy Smith's success as part of the [MEMBRA](#) project team within the first round, two further projects involving Bangor University have been awarded as part of the second round. The iDeer project, featuring Drs Graeme Shannon and Freya St John, will co-develop a tool to help woodland managers design tree planting schemes that are resilient to the potential impacts of deer. Drs Norman Dandy and Seumas Bates will contribute to the [DiversiTree](#) project which is focused on woodland diversification strategies, again with the goal of increasing woodland resilience.



Back in May, just after the publication of the last *Cynnal-Sustain* newsletter, Bangor's research in Earth Systems and Environmental Sciences was rated [1st in the UK for its impact](#) within the Research Excellence Framework. This is a fantastic achievement by our scientists - one of the largest groups of environmental scientists in the UK – who are seeking solutions to some of the planet's greatest environmental issues.



THE IMPORTANCE OF NEARBY NATURE TO WELLBEING

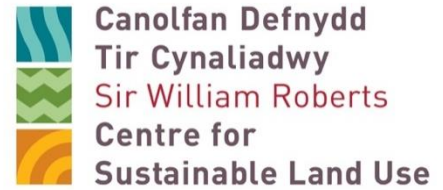
It is now well established that spending time in natural spaces and connecting with nature is beneficial for our physical and mental health. As well as helping us keep fit and allowing us to relax and unwind, people can also feel a greater connection to their communities, other people, the natural world and their past when they spend time in nature. However, access to nature, and therefore access to these benefits, is unequal across society.

Rachel Dolan's doctoral research here at Bangor University aimed to explore how far people travel to access nature, how this might vary depending on socio-demographic variables like income, gender, age and education, and also the importance of natural spaces to people's wellbeing. With the event of the Covid-19 pandemic, she also adapted her data collection to explore how the restrictions changed people's interactions with nature and how this impacted their wellbeing. Rachel used data from Strava, the biggest exercise social media platform, to explore how nature affects people's route choices when they are walking or cycling.

Rachel found that natural spaces closest to people's home were the most important to their wellbeing; importance decreased with increasing distance from home and natural spaces beyond 1 km were unimportant for individuals' day-to-day wellbeing. Through exploring the impact of Covid-19 restrictions, the research found that younger people were more likely to say there had been an increase in the frequency, time spent and distance they travelled to natural spaces, with the opposite pattern observed for older people. This could be because younger adults were furloughed or working from home so had more opportunity to spend time in their gardens or explore their local area.

Older adults, potentially more at risk and more anxious about the virus, stayed at home and inside. Those who did not have access to a garden were more likely to say that there had been a decrease in the frequency and time spent in natural spaces, and that the restrictions had a negative effect on their wellbeing.

The findings of this research emphasise the importance of natural spaces very close to people's homes and provide a tangible way to quantify nearby nature which could inform local and national government policy. The findings also suggest that efforts should be focused on ensuring that natural spaces are provided in locations where accommodation does not provide garden access (e.g., flats), maintaining the levels of greenspace access for young adults and increasing the levels of greenspace access for older people.



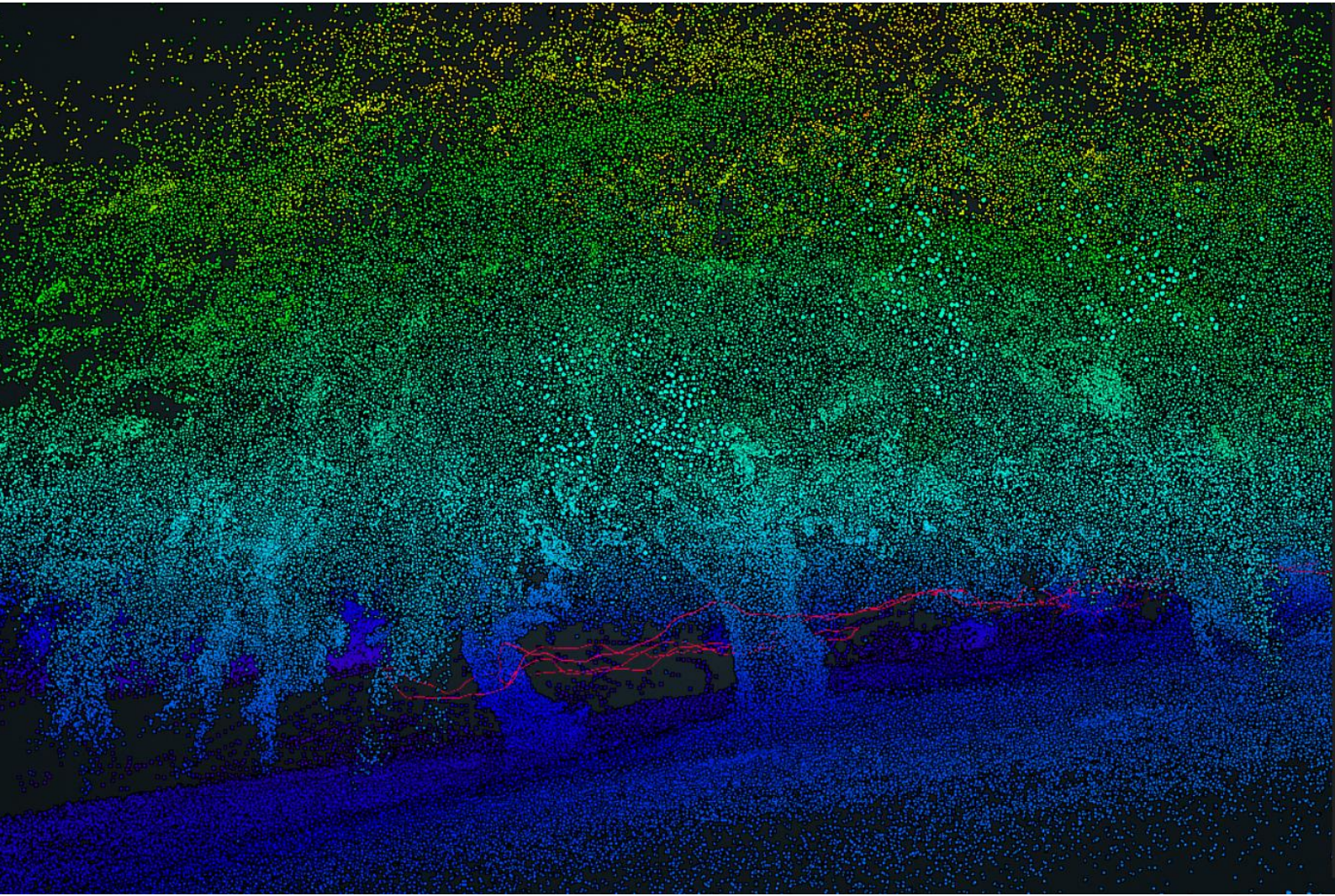


MANAGING LARGE HERBIVORES IN HUMAN TRANSFORMED LANDSCAPES



Researchers at Bangor have been studying wild fallow deer in the Elwy Valley of North Wales since late 2018. The population was established over 100 years ago during the First World War when animals from the Kinmel estate were released into the surrounding countryside. Since then, deer numbers have increased to approximately 1,500 individuals, and they inhabit the patchwork of woodlands and agricultural fields that characterise the valley. However, the population is also largely isolated from other deer populations due to historic overhunting. This allows us an opportunity to study their behaviour and sustainable management across a gradient of deer density and habitat use. At the core of the valley, close to the original release location, there are relatively high numbers of deer that exert considerable pressure on surrounding woodlands through their foraging and trampling. Whereas at the edge of their range, sightings of deer are rare and their effects on the environment much less apparent.





Owain Barton has been exploring what drives the distribution and habitat use of the deer using 40 remotely activated cameras deployed across the valley. Thousands of images were collected over two-years, which have allowed Owain to investigate how human activities (such as hunting and recreation) and environmental variables (such as woodland cover, grassland and terrain) influence the activity patterns and space-use of the deer population. This is crucial for targeted and effective management.

In parallel with this, Amy Gresham has been investigating how the fine-scale structure and species composition of the woodlands in the Elwy Valley influences diet and behaviour. Amy has used cutting edge terrestrial laser scanning technology to generate detailed 3D images of the woodlands. She has also carried out detailed field surveys of the tree species present and collected deer dung samples to extract genetic information on the identity of plant species that the deer have been eating at different locations and seasons.

We also have exciting new research kicking off in the coming months. Owain will be undertaking a new project exploring how deer activity, woodland structure and woodland size influence the diversity and abundance of bird species. Acoustic recorders will be deployed across a range of woodland habitats over the course of the spring, while the latest machine learning approaches will be employed for analysing the vocalisations of different species from the large acoustic dataset. Furthermore, Freya St. John and Graeme Shannon are collaborators on *iDeer* - a UKRI Treescape project led by Rebecca Spake at the University of Reading. *iDeer* aims to develop an online tool that supports wildlife practitioners in making evidence-based decisions for the strategic creation of new woodlands and sustainable management of deer.



LAND RELATED DOCTORAL RESEARCH

Postgraduate researchers (PGRs) are at the cutting-edge of research across the university sector. They are, by their nature, often exploring new ground, and at the heart of innovative data collection - testing new methods, theories, and technologies. They commonly play a bridging role between institutions involved in large collaborative projects. Bangor University is no exception to this and we benefit from the efforts of highly talented cohorts of doctoral and Masters-level researchers. *Cynnal-Sustain* has previously sought to highlight some of these individual contributions, however, such reports cannot capture the full breadth or diversity of work done relating to land-based sustainability by these colleagues across the university. Here are just some of the many projects being undertaken currently by PGRs at Bangor University. We will continue this list in future issues.

Assessing spatiotemporal patterns of resource use at the landscape-scale: a case study on fallow deer (*Dama dama*) in North Wales, UK **Owain Barton**

Identifying genetic markers for Early Blight (*Alternaria solani*) resistance in Tomatoes **Tim Beard**

Impact of ground level ozone on the nitrogen dynamics of wheat **Clare Brewster**

Deep soil: investigating carbon sequestration potential and greenhouse gas behaviour in agricultural subsoil **Erik Button**

Investigating the potential of forested lands for natural flood management in Wales **Matt Cooper**

The environmental trade-offs of mining in a biodiversity hotspot **Katie Devenish**

The role conservation organisations play in mitigating the impact of ash dieback in Wales **Ally Fraser**

Fallow deer (*Dama dama*) behaviour and diet as a function of woodland structure in North Wales **Amy Gresham**

On the pee! A mechanistic exploration of nitrogen and carbon cycling dynamics in the urine patch. **Danielle Hunt**

Reframing the Welsh landscape: The role of collective subjectivity in a time which calls for landscape change **Alex Ioannou**

Engineering the oak microbiome to suppress tree disease **Alejandra Ordonez**

The application of remote sensing to monitor pests and diseases in Welsh forests **Rob Taylor**

Women in Agriculture in North-East Wales, c.1550 - 1900 **Lizzy Walker**



Our PGRs are frequently responsible for the production of important outputs from their work, such as peer-reviewed papers or new analytic frameworks and models. Recent publications led by postgraduate researchers include:

Barton, O., Gresham, A., Healey, J. R., Cordes, L. S., & Shannon, G. (2022). The effects of population management on wild ungulates: A systematic map of evidence for UK species. *PloS one*, 17(6), e0267385

Button, E.S., Chadwick, D.R. and Jones, D.L., 2022. Addition of iron to agricultural topsoil and subsoil is not an effective C sequestration strategy. *Geoderma*, 409: 115646.

Dallison RJH, Williams AP, Harris IM, Patil SP (2022) Modelling the impact of future climate change on streamflow and water quality in Wales, UK. *Hydrological Sciences Journal* 67, 939-962.

Forster, E.J., J.R. Healey, C. Dymond & D. Styles (2021) Commercial afforestation can deliver effective climate change mitigation under multiple decarbonisation pathways. *Nature Communications* 12: 3831

Freeman, B.W., Evans, C.D., Musarika, S., Morrison, R., Newman, T.R., Page, S.E., Wiggs, G.F., Bell, N.G., Styles, D., Wen, Y., Chadwick, D.R., Jones, D.L. 2022. Responsible agriculture must adapt to the wetland character of mid-latitude peatlands. *Global Change Biology* 28: 3795-3811.

Hardaker, A., Styles, D., Williams, P., Chadwick, D. and Dandy, N., 2022. A framework for integrating ecosystem services as endpoint impacts in life cycle assessment. *Journal of Cleaner Production*: 133450.

Rhymes JM, Wynne-Jones S, Williams AP, Harris IM, Rose D, Chadwick DR, Jones DL (2021) Identifying barriers to routine soil testing within beef and sheep farming systems. *Geoderma* 404, 115298.

Williams NG, Gibbons JM, Chadwick DR, Marsden KA, Williams AP (2021) Increasing the productivity of an upland pasture with the least environmental impacts. *Agriculture, Ecosystems & Environment* 315: 107449.



TREE PLANTING IN THE FARMING PRESS



In recent years tree planting as a response to climate change has acquired a very high profile amongst policy-makers, scientists, the media, and the public. This 'afforestation', however, requires space: that is, land. Agriculture currently occupies very large areas of land globally meaning that it is commonly targeted as needing to make way for tree planting, and making farmers important gatekeepers to this climate change mitigation strategy. Farming sector media outlets have significant importance in reflecting, shaping and leading values and attitudes amongst the agricultural community. Given this context [Ashley Hardaker](#), [Theresa Bodner](#) and [Norman Dandy](#) at the Sir William Roberts Centre recently published a [paper](#) (freely accessible) investigating how tree planting is presented within two of the farming sector's most important publications: *Farmers Guardian* and *Farmers Weekly*.

The paper sampled coverage of this topic in both publications at four points over a two-year period (running from 2019 to 2021) which covered a time with high-profile national media and scientific engagement with the topic. The analysis revealed very low levels of coverage within these key publications with, on average, just 1 in 200 articles within the samples focusing directly on tree planting. The coverage broadly related to four themes ranging from hostility towards the notion of trees on farms replacing agricultural practices, through to occasional recognition of the positive roles that trees on farms can play in climate change mitigation.

A significant amount of the coverage framed tree planting as in direct competition with farming and food production.

These articles criticised tree planting on account of its likely implications for the 'replacement' of existing agriculture. Our analysis also found reporting on the financial aspects of tree planting was generally negative with attention given to associated inflation of land values and the bureaucracy entangled with accessing support to plant trees. On a more positive note, there was limited reporting on the role of tree planting on agricultural land as a means of enhancing the farming unit, although this unfortunately received the lowest amount of coverage. The paper also identified acknowledgements, albeit very low profile, of the increased integration of woodlands on UK farms as a valid response to climate change. Tree planting was noted very briefly across different article formats (e.g., letters; opinion pieces; interviews) as being one of a range of options available to farmers as the sector adapts to deliver 'net zero' as part of ongoing 'environmental' agriculture.

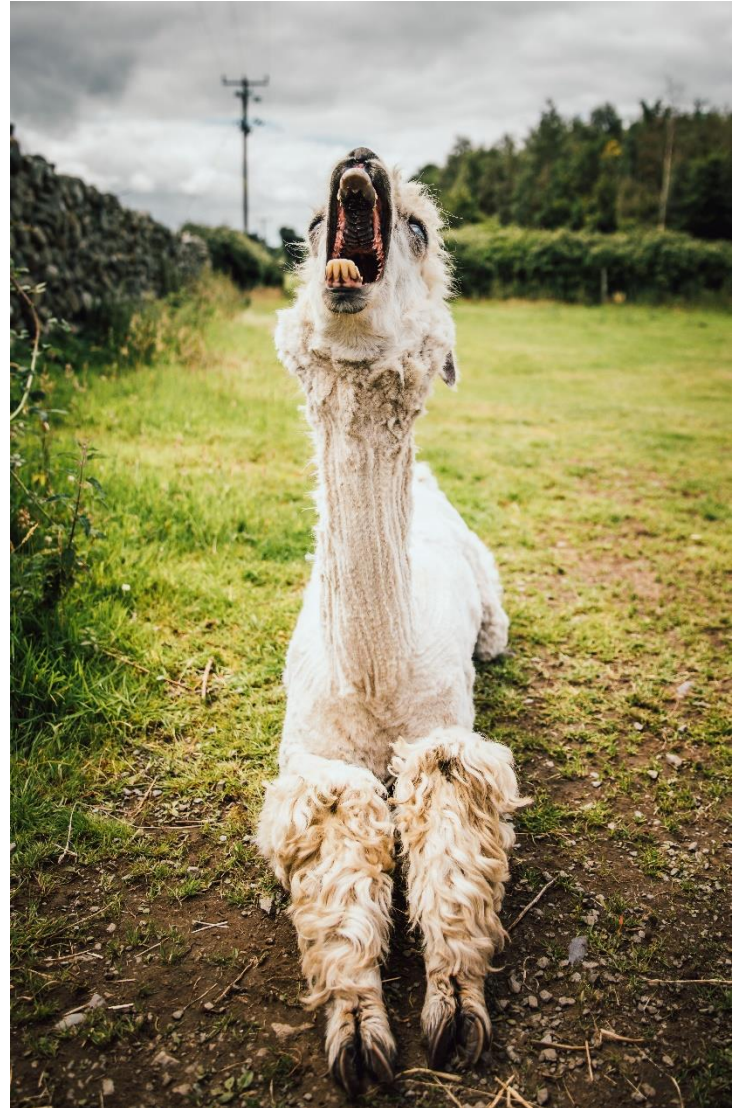
While it wouldn't be expected that tree planting will feature to an equal extent in the farming press as core agricultural matters (such as livestock management or crop protection), it does receive an extremely low amount of coverage. Media outlets and elements of society co-produce accepted group norms, values, and practices. Our analysis suggests, therefore, that tree planting and woodland creation are simply not currently considered as a significant or legitimate element of farming culture and practice. This can be seen as a significant problem. We argue that farming media outlets could play a much stronger role in supporting the agricultural community to understand how it can contribute to climate change mitigation through bringing trees 'in' to farming systems, and to the normalisation of this within modern farming culture.



@HENFAES

The first cohort of [Zoology with Animal Management](#) students are starting this coming semester. Numbers are healthy given that this is the first round of recruitment for the degree. The students will make extensive use of the facilities @Henfaes learning key skills relating to animal husbandry.

Two MZool project students have begun their research at Henfaes this September, investigating sheep anti-predator behaviours in the presence of Alpacas - supervised by Dr Katherine Jones and Dr Rhea Burton-Roberts. Alpacas have been suggested to be guardian animals, but there has been little research on whether they are effective. This study will apply classic behavioural ecology concepts such as Hamilton's selfish herd theory and the extensive knowledge-base on animal vigilance, to investigate if introducing Alpaca's to a sheep flock reduces perceived predation risk of sheep and therefore their investment in anti-predator behaviours.



Researchers at Bangor University are using the facilities @Henfaes as part of the *Reducing the Impacts of Plastic Waste in Developing Countries* project, funded by NERC and the GCRF programme. Plastic mulch films have been widely used within smallholder agriculture to promote food security and have transformed the livelihoods of millions of farmers across the world. This practice has, however, left a large legacy of plastic pollution in agricultural fields. The multi-year experiment is investigating (i) the effect of conventional (PE) and biodegradable (PHBV) microplastic on the growth of barley, (ii) the effect of conventional (LDPE) and biodegradable (PLA/PBAT) plastic mulch films on the growth of maize, and (iii) the degradation rates of 8 different mulch films. The researchers are also monitoring changes to soil physical properties, biochemical processes, microbial community structure, and the vertical migration of microplastic particles through the soil profile.

