

Project title and location: Hedgerow and field margin monitoring technologies: value and acceptability for agri-environment payments. School of Natural and Environmental Sciences, Newcastle University.

IAFRI background: The Institute for Agri-Food Research and Innovation (IAFRI) is a joint venture between Newcastle University and Fera Science Ltd and a unique model for how universities can work with private sector research organisations. It operates under a private-public ownership to deliver both public good research and services as well as innovation and wealth creation in strategically important industrial sectors in the UK. Students will have a unique opportunity to benefit from supervision and facilities at both the Newcastle and Sand Hutton campuses to deliver research with real-world impact.

Lead Supervisors (and contact): For more information and details on how to apply please contact Dr Rachel Gaulton, Newcastle University, (rachel.gaulton@ncl.ac.uk) Co-supervisors: Dr Glyn Jones, Dr Naomi Jones, Fera Science Ltd.

Key research gaps and questions: Public money for public goods is a common mantra within government. Proposed new agri-environment schemes are expected to move from a model of prescriptive management options to ones based on outcomes, in terms of preservation of biodiversity and ecosystem services. However, this raises questions as to how meaningful outcomes are monitored and how this relates to payments to land managers. New remote sensing technologies, including ground-based, drone and satellite sensors, have much promise for monitoring aspects of agricultural environments, including hedgerows and field margins. The project will address the research question: **Can ground-based sensor, drone and satellite technology appropriately measure biodiversity proxies that are sufficient to justify public goods payments to farmers?**

Project Description: The highly interdisciplinary project will address key objectives, using techniques from ecology, remote sensing and socio-economics:

O1) Systematic review of literature and use of expert interview, to identify a set of optimal, measurable and ecologically justified vegetation structure and composition proxies for key biodiversity outcomes.

O2) Assessment of remote sensing technologies, including terrestrial and mobile laser scanning, drone imaging and satellite data, for retrieval of priority proxies at whole-farm scales.

O3) Cost:benefit analysis of technologies in terms of operational deployment within agri-environment schemes, including consideration of optimal modes of deployment and communication of results and uncertainties.

The student would be based in the Modelling, Evidence and Policy research group, giving access to a range of both low-cost and state-of-the-art sensing systems, including ground-based laser scanners and drone sensors. Training in drone operation will be provided. Skills will be developed in a variety of data processing methods (e.g. image processing, programming). Depending on student background, the student will also receive training in ecological methods and in socio-economic analysis and will engage closely with the socio-economics team at Fera.



3D hedgerow model from drone imagery

Desired skills: This interdisciplinary project is likely to suit a student with a 1st/2.1 degree or equivalent in remote sensing, geomatics, ecology, agriculture or socio-economics related subjects. Applicants may also hold / be completing, a relevant Masters degree. Candidates with a background in physical sciences or computer science and an interest in applying these skills to ecological challenges are also encouraged to apply. Scientific programming, experience with socio-economics methods, image processing and ecological survey skills will also be viewed as advantageous. Applicants must be willing and able to carry out UK-based fieldwork and hold / obtain a full UK driving license.