UKRI Policy Fellowships 2023: Fellowship Opportunity Description

Fellowship Title: *Defra Building a Green Future Data Science and Agriculture Fellowship*

Host Organisation: [Department for Environment, Food & Rural Affairs - GOV.UK (www.gov.uk)](www.gov.uk)

Host Team: *Environmental Land Management Evidence and Analysis*

Summary: *Opportunity to use data science, natural science or agronomy to improve understanding of the impacts of the Environmental Land Management schemes.*

Fellowship Theme: *Building a Green Future*
Please see the full call text 'What We Are Looking For" for a detailed summary of the research themes targeted in this call

Policy Topic: *Net Zero, Environment Act, Environmental Land Management*

Research Council: *BBSRC*

Academic Discipline/s: *Data Science, Natural Science, Agricultural Science*

Research Career Stage: *Both Early and Mid Career are eligible for this fellowship.*

Fellowship Structure

Inception Phase:

  Estimated Start Date: October 2023. *Exact date to be confirmed by the host depending on onboarding and security clearance requirements*
  Duration: 3 months
  FTE: 0.4 FTE

Main Placement Phase:

  Duration: 12 months
  FTE: 0.6-1 FTE

Knowledge Exchange Phase:

  Duration: 3 months
  FTE: 0.4 FTE

Work Arrangements

Location Requirements: *There are no location requirements for this fellowship as the team works remotely, there may be a requirement to occasionally travel for specific events to one of Defra's Hubs or another location.*

Travel and Subsistence: *Eligible T&S costs are supported in the main UKRI grant. Please see full call text and guidance for more details.*

Hybrid Working: *Applicant's preference, they can work entirely remotely or in an office or hybrid.*

Security Clearance: *Successful applicant will require Basic Personnel Security Standard checks, if the applicant is based in London and wants to work from the Marsham Street office they will need a minimum Counter Terrorist Clearance (CTC). Basic Personnel Security Standard checks (BPSS), usually takes around 6 weeks. We would expect the successful applicant to start the security clearance application process, with support from the host team, as soon as their Fellowship has been confirmed by ESRC. Ideally the security clearance process would be completed before the inception phase begins as it is required for access to Defra IT. See National security vetting: clearance levels – GOV.UK (www.gov.uk) for details on who is eligible and requirements. An applicant can get BPSS and then work from home or elsewhere while we process CTC for London offices.*

Fellowship Opportunity Description

This fellowship is an opportunity for a researcher to directly impact policy around the new Environmental Land Management schemes helping to provide better evidence to support scheme design. We are introducing three new schemes that reward environmental benefits. These schemes will pay for sustainable farming practices (such as reducing carbon emissions, creating and preserving habitat, and making landscape-scale environmental changes) and improvements to animal health and welfare. This is an important step towards achieving our 25 Year Environment Plan ambitions and our carbon net zero goals.   This fellowship would be embedded within the ELM evidence and analysis function primarily working within the Data Science and Modelling Team. We use data science techniques and advanced models to simulate the schemes and their environmental impacts. This requires highly detailed data which is often quite challenging to find and then even more challenging to incorporate into the modelling. We have several areas where we would benefit from expanding our existing knowledge or modelling capability as such, we would suggest a fellow would investigate one or more of the following research areas:

- Researching the distribution of forage crops / fodder crops across the country and at a field scale and how we can effectively model this. This is primarily about understanding and modelling the energy requirements of livestock, estimating how much energy is available to the livestock on the farm and how much is brought in as well as how this system works across the country. We can use this information to understand the impact that interventions or management changes will have on livestock food production and the knock-on impacts this would have on arable crops grown for livestock. Much of this work would initially be collating data sources on energy requirements and production as well as the breakdown of how arable crops are assigned to be either for human consumption or animal consumption. This could then be brought into a simulated farming population for an agent based model system of agri-environment interventions.

- Researching the synergistic or antagonistic effects of performing multiple agri-environment actions or interventions concurrently on ecosystem services. This will allow us to know whether there are actions which should be bundled together or whether people who are applying to schemes should be provided extra incentive to perform actions together. This would likely be done through a review of the impacts of agri-environment scheme actions to collect underlying impact data if available and then ecosystem service modelling or even first principle biophysical process modelling to understand interactions out likely environmental outcomes.

- Researching how to emulate complex ecosystem service models for faster use with agent based models. Within the ELM modelling strategy we have both quick to run behaviour focused agent based models and large scale ecosystem service models which need massive parameterisation and run over a much longer timespan. As such there is a need to create a method of emulation of the ecosystem service models so they can be run more rapidly and create a bi-directional system between them and the agent-based models allowing for feedback loops and optimisation. We envision this would be done through the machine or deep learning methods applied to the model outputs to produce a predictive emulator with fast run-times. This will project will require close work with our academic modelling consortium to understand the underlying ecosystem service models and the inputs they take and then require model construction, tuning and deployment.

All projects will directly feed into the ELM modelling strategy which will help to inform scheme design, scheme impact prediction, and help answer policy questions. We expect each project to produce code or software that can be integrated into the modelling, and we will require full knowledge transfer at the end so Defra can go on using the outputs at the end of the fellowship.

Applicants will have the opportunity to produce literature reviews and to publish peer reviewed articles for some of the work depending on the sensitivity of data used. They will also gain experience in working directly on fast paced policy areas, have access to a broad range of civil service learning and training opportunities and be part of department and government wide data science networks. There are opportunities to work with scientists from across multiple disciplines including economics and social science.

Person Specification

Applications will be assessed against the following opportunity-specific requirements in addition to the generic eligibility and call criteria.

Essential Criteria:

- Applicants will need to have a proven academic track record in data science, natural science or agricultural science and a willingness to learn about other areas.
- All applicants will need to have proven skills in data science, data analytics or statistics using an analytical programming language either R or Python.
- Ability to communicate complex topics to a variety of stakeholders with different technical backgrounds.
- Ability to work as part of a diverse team and willingness to engage with colleagues across multiple disciplines.

Desirable Criteria:

- A history of applying data science methods to natural science or agricultural problems, preferably in the British farming system.
- A knowledge of most common machine learning methods or deep learning methods.
- Preferably a candidate would have knowledge of agent-based models or emulation of complex system models using machine learning.
- A quantitative background in statistics and mathematics is also desirable but not essential
- Any experience in software engineering or deployed machine learning environments would be beneficial.