**PhD studentship Project information**

**Funding Source:** CENTA DTP

**Proposed start date:** 25th September 2023

**Closing date for applications:** 11th January 2023

**Eligibility:** UK/International

**Department/School:** SGGE

**Supervisors:** **PI: Dr Joerg Kaduk (Uni Leicester) (jk61@le.ac.uk )**

**Co-Is: Prof Susan Page (Uni Leicester) (****sep5@le.ac.uk****),**

**Dr Arnoud Boom (Uni Leicester) (****ab269@le.ac.uk****),**

**Dr Anne Jungblut (Natural History Museum),**

**Prof. Chris Evans, CEH,** **cev@ceh.ac.uk**

**Project Title:** Fen Farming Futures: Benefits and drawbacks of sustainable farming on organic soils

**Project Description:**

**Project Highlights:**

* The project will offer the opportunity to study alternative management options for the intensively farmed peatlands of the East Anglian Fens, now recognised as being the largest source of land-based greenhouse gas emissions in the UK, and to work with local farmers and Cambridgeshire County Council (major land owner in the Fens and CASE partner).
* It will combine an extensive programme of field measurements with in-depth analysis of peat geochemistry and peat microbial communities.
* The project aims to produce the first comparison of peatland under business-as-usual versus sustainable, ‘regenerative’ farming by exploring differences in soil greenhouse gas emissions, soil chemistry and biology, to establish how these are affected by land-use. Data will be used to provide science-based evidence for climate change mitigation schemes.

**Overview**

In England, lowland peat occupies around 960 km2 and stores large amounts of carbon. Nearly all lowland fen peatland has been drained to provide some of the most fertile agricultural soils in the UK. However, drainage has resulted in loss of peat (with rates of ~1 cm/yr under intensive agriculture) and associated high CO2 emissions. Until recently, there had been limited scientific focus on the greenhouse gas (GHG) fluxes from lowland peatlands, but recent studies involving several of the supervisors have highlighted their scale, with intensively farmed lowland peatlands now known to be the largest land-based source of GHG emissions in the UK (Figure 1). To date, almost no research has been undertaken on agricultural management options to reduce C loss and GHG emissions whilst also improving soil health. This project provides a unique opportunity to study the effects of implementing more sustainable farming management practices on soil and climate security. An improved understanding of the strategies available for fenland farmers will provide important insights as to whether alternative agricultural management strategies on peat soils can provide emissions mitigation and other co-benefits, in comparison to conventional land management. This will provide data which will help inform landscape-scale feasibility planning for reduced GHG emissions, improved biodiversity, natural reserves, and ecosystem CO2 uptake by the CASE partner, Cambridgeshire County Council who are a major agricultural land-owner in the Fens.



**Figure 1:** Lowland Fen Peat areas in East Anglia showing the extent of peat loss from soils (wasted peat: less than 50cm peat left). Ultimately, without interventions nearly all peat will be lost from the area. Locations of ongoing measurements of GHG fluxes by the supervisory team are indicated by the coloured circles.

**Methodology:**

The PhD will measure soil respiration *in situ* using a Licor 8100 field CO2 and H2O analyser, at replicated sites under conventional and modified agricultural management in the Fens. Samples will be collected for characterisation of peat physical, hydrological, geochemical and microbiological properties to gain mechanistic understanding of controls on GHG fluxes and influence of different farming techniques on soil health. Organic geochemical analyses will be undertaken at UoL, including pyrolysis GCMS and FTIR, with comparisons to data from other lowland peat land sites. Taxonomic richness and microbial community structure will be analysed via high-throughput DNA sequencing and bioinformatics at the NHM, and compared to existing sequencing data from other temperate peatland sites. The student will also work with the CASE partner (Cambridgeshire County Council) to analyse and interpret Earth Observation (EO) data, allowing upscaling of site-based observations in relation to the potential for large-scale land-use change.

**References:**

*Journal:*

Matysek, M., Leake, J., Banwart, S., Johnson, I., **Page, S.,** Kaduk, J., Smalley, A., Cumming, A., & Zona, D. (2021) Optimizing fen peatland water-table depth for romaine lettuce growth to reduce peat wastage under future climate warming.*Soil Use and Management.* [DOI: 10.1111/sum.12729](https://doi.org/10.1111/sum.12729)

Evans, C.D., Peacock, M., Baird, A.J., Artz, R., Brown, E., Burden, A., Callaghan, N., Chapman, P.J., Cooper, H. M., Coyle, M., Cumming, A., Dixon, S., Helfter, C., Heppell, C., Holden, J., Gauci, V., Grayson, R.P., Jones, D., Kaduk, J., Levy, P., Matthews, R., McNamara, N., Misselbrook, T., Oakley, S., **Page, S.,** Rayment, M., Ridley, L.M., Stanley, K., Williamson, J., Worrall, F., Morrison, R. (2021) Overriding influence of water table on the peatland greenhouse gas balance. *Nature*, 593 (7860), 548-552.

Ritson, J., Alderson, D., Robinson, C., Burkitt, A., Heinemeyer, A., Stimson, A., Gallego-Sala, A., Harris, A., Quillet, A., Malik, A., Cole, B., Robroek, B., Heppell, C., Rivett, D., Shuttleworth, E., Lilleskov., E., Cox, F., Clay, G., Diack, I., Rowson, J., Pratscher, J., Lloyd, J., Walker, J., Belyea, L., Dumont, M., Longden, M., Bell, N., Artz, R., Bardgett, R., Griffiths, R., Andersen, R., Chadburn, S., Hutchinson, S., **Page, S.**, Thom, T., Burn, W. & Evans, M. (2020) – Towards a microbial process-based understanding of the resilience of peatland ecosystem service provisioning – a research agenda. *Science of the Total Environment.* <https://doi.org/10.1016/j.scitotenv.2020.143467>

Leifeld, J., Wüst, C. & **Page, S**. (2019) Intact and managed peatland soils as a source and sink of greenhouse gases 1850–2100. *Nature Climate Change*, 9, 945–947. doi:10.1038/s41558-019-0615-5

*Web:*

Lowland Peat Project: <https://lowlandpeat.ceh.ac.uk/>

England Lowland Peat Action Plan: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1010786/england-peat-action-plan.pdf>

**Funding details:**

NERC CENTA studentships are for 3.5 years and are funded by NERC. In addition to the full payment of your tuition fees, you will receive the following financial support:

* Annual stipend, currently set at £ 17,668 (2022/3 – new figures to be confirmed spring 2023)
* Research training support grant £8,000 (RTSG)

\* If you do not meet the criteria for UK Fees you will need to fund the difference between UK and International fees for the duration of your studies.

\* A limited number of top up studentships to fund the difference between UK and International fees may become available but are not guaranteed.

For more details of the CENTA consortium please see the CENTA website: [www.centa.org.uk](http://www.centa.org.uk) .

**Entry requirements:**

Applicants are required to hold/or expect to obtain a UK Bachelor Degree 2:1 or better in a relevant subject or overseas equivalent.

The University of Leicester [English language](https://le.ac.uk/study/research-degrees/entry-reqs/eng-lang-reqs) requirements apply where applicable.

**Application advice:**

To apply please refer to

<https://le.ac.uk/study/research-degrees/funded-opportunities/centa-phd-studentships>

With your application, please include:

* CENTA Application form - available to download on the How to Apply section of the above link
* CV
* Personal statement explaining your interest in the project, your experience and why we should consider you
* Degree Certificates and Transcripts of study already completed and if possible transcript to date of study currently being undertaken
* Evidence of English language proficiency if applicable
* In the reference section please enter the contact details of your two academic referees in the boxes provided or upload letters of reference if already available.

In the funding section please specify that you wish to be considered for Ref CENTA2-SGGE11-KADU

In the proposal section please provide the name of the supervisors and project title (a proposal is not required)

**Project / Funding Enquiries to:** **CENTA@le.ac.uk** **or** **jk61@le.ac.uk**

**Application enquiries to** **pgradmissions@le.ac.uk**

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