



Carbon Pools, GHG Fluxes, and Microbial Function in Sitka Spruce Forests Across Soil Types

Walsh Scholars Reference Number: 2026005

Research Institution: Teagasc

University: University of Limerick

Location: Teagasc Johnstown Castle, Co. Wexford

Funding: Teagasc

Proposed Start Date: September 2026

Project Summary

Forestry plays a critical role within Ireland's agri-food and land-use systems, supporting timber production, rural economies, and national climate mitigation objectives. Sitka spruce (*Picea sitchensis*), the dominant plantation species in Ireland, is widely assumed to function as a carbon sink. However, its overall greenhouse gas (GHG) balance remains poorly constrained, particularly across contrasting soil types such as mineral soils and drained peatlands.

This PhD project will investigate how soil type influences carbon stocks, soil GHG fluxes (CO₂, CH₄, and N₂O), litter decomposition, and microbial processes in Sitka spruce forests. Using paired forest sites, the research will integrate field-based measurements of biomass and soil carbon with seasonal GHG monitoring, decomposition experiments, and microbial DNA and functional gene analyses.

The project will identify the conditions under which Sitka spruce plantations deliver net climate benefits. The findings will inform improved GHG inventory emission factors, support climate-smart forestry management, and contribute to evidence-based decision-making across Ireland's agri-food and land-use sectors.

Supervision

The successful candidate will be supervised by Dr Junliang Zou (Teagasc), with co-supervision provided by Dr Fiona Brennan (Teagasc) and Professor Ken Byrne (University of Limerick). The supervisory team provides expertise in soil biogeochemistry, greenhouse gas emissions, microbial ecology, and environmental science, offering a strong and well-aligned supervisory framework for the project.

Research Environment

You will be registered at the University of Limerick and based at Teagasc Johnstown Castle, a national centre of excellence for agri-environmental and climate research, for the duration of your studies. The project offers access to state-of-the-art laboratory facilities, long-term experimental sites, advanced analytical infrastructure, and strong national and international research networks.

As a Walsh Scholar, you will be part of a vibrant interdisciplinary research community and will benefit from regular seminars, collaborative research opportunities, and engagement across soil science, forestry, microbiology, and climate mitigation research.

Career and Training Opportunities

The Teagasc Walsh Scholars Programme provides a structured, four-year training and development framework designed to support both academic excellence and career readiness. You will develop advanced scientific and analytical skills alongside transferable skills in communication, project management, and stakeholder engagement through expert-led training, workshops, and tailored professional development.

Scholars will have opportunities to present their research at national and international conferences, supporting professional networking and engagement with the wider research community. Final-year career



supports focus on preparing scholars for impactful careers in research, industry, advisory services, and policy, both in Ireland and internationally.

Walsh Scholars may also be recognised through the Walsh Scholars of the Year and Gold Medal Awards, which celebrate outstanding research excellence, innovation, and impact.

Through the Teagasc International Training Awards, you may be supported to undertake an international research placement of up to 12 weeks at a leading university or research institute aligned with your PhD project.

Candidate Profile and Eligibility

Applicants should ideally:

- Hold a First or 2.1 Honours degree (or Master's) in forestry, environmental science, ecology, soil science, geography, biological sciences, or a closely related discipline
- Demonstrate experience in field-based and/or laboratory research, with strong quantitative and data-handling skills
- Show the ability to apply multidisciplinary approaches to hypothesis-driven research (e.g. integrating field measurements, laboratory analyses, and statistical modelling)
- Demonstrate an interest in forest carbon cycling, greenhouse gas emissions, soil processes, and/or microbial ecology
- Possess strong written and verbal communication skills and the ability to work effectively both independently and as part of a research team
- Be willing to undertake regular fieldwork at forest sites across Ireland, in all seasons
- Hold a full, clean driving licence valid in Ireland
- Meet University of Limerick postgraduate entry requirements, including English language requirements where applicable

Funding Details

This is a fully funded four-year PhD funded by Teagasc, including:

- €25,000 annual stipend
- University fees covered up to €6,000 per annum

How to Apply

Applicants should complete the [online application form](#) by **5:00pm on Wednesday, 18 March 2026**. Applications must include a curriculum vitae and a 1–2 page statement of motivation, submitted as part of the online application.

Interview

Shortlisted candidates will be invited to interview in **early to mid-April 2026**.

Online interviews can be accommodated.

Further Information

Informal enquiries are welcome and may be directed to: Dr Junliang Zou – junliang.zou@teagasc.ie

Further information on the Walsh Scholars Programme is available at:

<https://www.teagasc.ie/about/research-innovation/the-walsh-scholars-programme/about-the-programme/>