



## Enhancing Environmental Modelling of Irish Grass-Based Dairy Systems

**Walsh Scholars Reference Number:** 2017273

**University:** University College Cork

**Funding:** Research Ireland

**Research Institution:** Teagasc

**Location:** Teagasc Moorepark, Co. Cork

**Proposed Start Date:** Sept 2026 or earlier

### Project Summary

Grass-based dairy systems are central to Irish agricultural production and sustainability policy. Models such as MoSt Grass Growth (MoSt GG) and the Pasture-Based Herd Dynamic Model (PBHDM) are widely used to support decision-making in pasture-based dairy systems. While these models perform well in simulating grass growth and nitrogen dynamics, their representation of environmental processes remains limited, particularly in relation to greenhouse gas emissions and nutrient trade-offs.

This PhD project will enhance the environmental modelling capacity of MoSt GG and PBHDM to support integrated assessment of productivity, water quality, and greenhouse gas emissions at both paddock and whole-farm scale. The research will improve the representation of nitrogen leaching and emissions by incorporating ceramic cup data and, where available, lysimeter measurements. Particular emphasis will be placed on representing the effects of urine patch dynamics, fertiliser type, and slurry application methods.

The modelling framework will also be extended to include key soil fertility indicators, including phosphorus, potassium, and soil pH, alongside an initial estimation of phosphorus runoff. The recent inclusion of clover growth within MoSt GG will enable evaluation of grass–clover systems, including implications for fertiliser use, nutrient losses, and emissions.

Enhanced environmental outputs will be integrated within PBHDM, including simplified animal-side emission calculations. The project will deliver an improved modelling framework to assess environmental trade-offs in Irish grass-based dairy systems and will contribute directly to the Vistamilk system-of-systems.

### Supervision

The project will be supervised by Dr Elodie Ruelle at Teagasc, whose research focuses on grassland systems modelling, nutrient dynamics, and the environmental assessment of pasture-based livestock systems. She will lead project coordination, model development, and integration of the research within the Vistamilk programme.

Co-supervision will be provided by Dr William Burchill from the School of Biological, Earth and Environmental Sciences at University College Cork (UCC). Dr Burchill's expertise includes nitrogen cycling, greenhouse gas emissions, ammonia emissions, biological nitrogen fixation, and nitrogen and phosphorus losses to water.

### Research Environment

The Walsh Scholar is part of the VistaMilk Research Centre based at Teagasc Moorepark and will be registered at University College Cork. VistaMilk is Ireland's centre for digital innovation in sustainable, pasture-based dairy systems and is co-funded by Research Ireland and the Department of Agriculture, Food and the Marine. VistaMilk offers access to world-class research facilities, interdisciplinary collaboration, and strong industry engagement. As a Walsh Scholar, you will also benefit from an active postgraduate research community and structured doctoral training at University College Cork.



The project offers opportunities to develop advanced skills in environmental modelling, data analysis, and whole-farm systems assessment. The student will engage with the VistaMilk research programme, including interdisciplinary collaboration, policy-relevant research, and stakeholder engagement. Opportunities for conference attendance, international collaboration, and scientific publication are expected.

### **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 long-term career readiness. Scholars develop advanced scientific and analytical expertise alongside transferable skills in communication, project management, and stakeholder engagement through expert-led training, workshops, and tailored professional development.

Opportunities are provided to present research at national and international conferences, supporting professional networking and active engagement with the wider research community. Dedicated final-year career supports focus on preparing scholars for impactful roles across research, industry, advisory services, and policy, in Ireland and internationally.

Through the Teagasc International Training Awards, scholars may undertake an international research placement of up to 12 weeks aligned with their PhD project. Outstanding achievement may also be recognised through the Walsh Scholars of the Year and Gold Medal Awards.

### **Candidate Profile and Eligibility**

Applicants should ideally have:

- A minimum 2.1 Honours degree (or equivalent) in agricultural science, environmental science, data science, or a related discipline
- Strong interest in grassland systems, environmental sustainability, or agricultural modelling
- Experience with data analysis and quantitative methods
- Ability to work independently and as part of a multidisciplinary research team
- Strong written and verbal communication skills
- Meet University College Cork postgraduate entry requirements, including English language requirements where applicable
- A valid driving licence may be desirable

### **Funding Details**

This is a fully funded four-year PhD funded by Research Ireland

- €25,000 annual stipend
- University fees covered up to €5,750 per annum

### **How to Apply**

Applicants should submit a CV and covering letter detailing their qualifications and experience to Elodie Rouelle [Elodie.Ruelle@teagasc.ie](mailto:Elodie.Ruelle@teagasc.ie) and William Burchill [wburchill@ucc.ie](mailto:wburchill@ucc.ie) quoting “Walsh Scholars PhD Application – Ref 2017273” in the subject line. **Application closing date: 5 pm, Friday 26<sup>th</sup> June 2026.**

### **Interviews:**

Shortlisted candidates will be invited to interview in **early July 2026**. Online interviews can be accommodated.



### **Further Information**

Informal enquiries are welcome and may be directed to: [Elodie.Ruelle@teagasc.ie](mailto:Elodie.Ruelle@teagasc.ie)

Learn more about the Walsh Scholars Programme at: <https://teagasc.ie/about/research-innovation/the-walsh-scholars-programme/about-the-programme/>