



Trinity College Dublin  
Coláiste na Tríonóide, Baile Átha Cliath  
The University of Dublin



**Funded PhD position- *Investigating a nature-based solution for agricultural runoff in Ireland: Identification of nutrient/trace element accumulator plant species and their microbial interactions***

Diffuse water pollution from agricultural sources in the form of excessive nutrient run-off and drainage discharge is a persistent global contamination source of water quality in rural and agricultural catchment streams and a growing challenge in farming systems. Numerous studies have reviewed the effectiveness of vegetative buffer strips (VBSs) in retaining nutrients from runoff and overland flow. Moreover, VBSs separate agricultural land management activities from water courses by dispersing runoff through thick vegetation and root networks. The microbial constituents of plants, such as arbuscular mycorrhizal fungi (AMF), have been shown to improve plant growth, nutrient transformation, and accumulation, and have great potential to improve phosphorous tolerance and phytoremediation. This PhD project will focus on the (1) identification of native (Irish) nutrient accumulator (VBS) plant species in agricultural settings and their functional characteristics, (2) identify and characterize associated AMF and/or other microbial constituents with selected plants, and (3) assess nutrient accumulating capabilities of plants with native and/or inoculated AMF. Results from this study will contribute to the aim of the NuReCycle project by establishing a sustainable way that farmers can myco-phytoremediate agricultural soils, and in turn, use these plants at the end of a season as a nutrient sorbent biochar/natural overwintering green manure.

NuReCycle is an interdisciplinary project that explores factors driving diffuse water pollution from agricultural sources in Ireland and seeks to develop integrated nutrient control, recovery, and recycling systems. The project is generously funded by a Kinsella Challenge-based E3 Multi-disciplinary Project Award. For more information see [website link]

This award provides a unique opportunity for a doctoral student to pursue interdisciplinary research in the thriving intellectual community at Trinity College Dublin. Based in the School of Natural Sciences in the Botany Department, and enrolled in the Research PhD Programme, the PhD student work will closely with the other researchers involved in NuReCycle.

### **Applications**

Applications can be made by [clicking here](#) on or before the 30<sup>th</sup> November 2021.

Applications should be submitted within a single PDF document that includes a CV with educational background, transcripts of degree results, list of publications and conference presentations, a short (1–2 page) letter of motivation and contact details for 2 referees. The motivation letter should clearly state how the applicant's research interests and skills relate to the research project outlined above. Applications will not be considered complete until referees have submitted their references. If the successful candidate does not have English as a first language, they will also be required to submit evidence of English language competence at this stage.



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We are looking for applicants with the following qualifications:

**Essential:**

- A first-class (or equivalent) undergraduate degree in mycology, or botany, or another discipline directly relevant to the topic
- Excellent communicative (written and oral) competence in English
- Excellent research, protocol design, and organisational skills
- Ability to work and drive to field locations (ability to drive in Ireland, and/or complete license exam by start of PhD position)
- Be a self-directed individual and able to work in a collaborative, structured environment

**Desirable:**

- A Master's degree (completed or in progress) in mycology, or botany, or related discipline directly relevant to the topic
- Demonstrable experience of field botany and/or mycology, and plant identification
- Demonstrable experience of working with arbuscular mycorrhizal fungi (field and laboratory settings)
- Demonstrable experience of statistical analysis
- Familiarity with transmitted light microscopy image capture
- Evidence of publication (or in press) in international peer-reviewed journals
- Willingness to the activities of the Botany Department

**Further enquiries:**

Dr. Carla J. Harper ([charper@tcd.ie](mailto:charper@tcd.ie))



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### **Funded PhD-position: *Microbially driven recycling of nutrients from recovered VBS plants/fungi through Green manure and Biochar***

As part of the Kinsella Challenge-based E3 Multi-disciplinary Project Awards, the Antimicrobial Resistance and Host Modulation research group at Department of Microbiology, Trinity College Dublin invites applications for a PhD Project Award, starting in March 2022. This PhD will be part of a very dynamic, integrative and transdisciplinary team of researchers under the project NuReCycle. NuReCycle is focused on diffuse agricultural water pollution and application of integrated nutrient control, recovery and recycling innovative systems. In this project, the PhD student will conduct research on the recovery of elemental and/or nutrient rich vegetation for use as fertilizer or biochar.

Diffuse water pollution from agricultural sources in the form of excessive nutrient run-off and drainage discharge is a persistent global contamination source of water quality in rural and agricultural catchment streams and a growing challenge to progressing the principles of the Sustainable Development Goals (SDGs) in our farming system. Surface and subsurface runoff has a complex composition including nitrates, ammonium, phosphorus compounds, and persistent organic pollutants. Phosphorus (P) and Nitrogen (N) promote the excessive growth of aquatic weeds and algae, and once they die these deplete the oxygen content of the water which can degrade and kill other animals and plants, impacting the overall biodiversity of the system. Anthropogenic eutrophication is recognised as a significant global water pollution problem which is often linked with intensive agricultural practices and has strong potential to impact the health, security of aquatic ecosystems and water supplies. Improved P and N nutrition is the most recognized benefit of AMF symbiosis for host plants. Leguminous plants, e.g., *Trifolium* spp. (common clover), barrel clover (*Medicago* spp.), *Pisum* spp. (peas), can have two different root symbioses: AMF and a specialized, natural occurring N-fixing bacterial symbiont, rhizobia. In addition, certain plants, through the help of AMF, can readily uptake and absorb certain heavy metals (e.g., As, Cd) and are known as hyperaccumulators. In this project, the PhD candidate will use laboratory experiments to elucidate which combination of AMF and leguminous plants provide the most P and N uptake. The PhD candidate will also identify field areas with high agriculture runoff and test the soil toxicity. The candidate will also identify any plants in these areas for naturally occurring hyperaccumulators, their AMF plus any potential rhizobia, through mycorrhizal extraction and molecular analysis by conducting 16S rRNA (bacteria) and 18S rRNA (fungal) gene sequencing. Selected plants will then be collectively, termed simulated recovered VBS plants (SR-VBSP), tested to quantify the amounts of heavy metals absorbed. The SR-VSBPs will be tested for toxicity by using the MTS assay in a well-established cellular model of human monocytes to see if they could be safely used as a biochar or green manure. Ultimately, and based on field season conditions, the results obtained will be transferred and conducted in an agricultural field setting. These plants and their microbial constituents can be a sustainable way that farmers can myco-phytoremediate the soil and, in turn, use these plants at the end of a season as a nutrient sorbent biochar/ natural overwintering green manure. NuReCycle is an interdisciplinary project that explores factors driving diffuse water pollution from agricultural sources in Ireland and seeks to develop integrated nutrient control, recovery, and recycling systems. This award provides a unique opportunity for a doctoral student to pursue interdisciplinary research in the thriving



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intellectual community at Trinity College Dublin. Based in the Department of Microbiology, School of Genetics and Microbiology and enrolled in the Research PhD Programme, the PhD student will work closely with the other researchers involved in the NuReCycle Project [link to NuReCycle page].

### **Applications**

Applications can be made [by clicking here](#) on or before the 30<sup>th</sup> November 2021 with the position being available from March 2022.

Successful candidates should have an **excellent background in microbiology, biotechnology or similar area and good laboratory skills, preferably with a Master's degree** relevant to the area of research of the PhD.

All applicants must have an excellent level of English written and spoken. When English is not the mother tongue or the applicant has not been educated through the medium of English, the candidate must present evidence of English language competency. The successful applicant will be based in Trinity College Dublin. Founded in 1592, Trinity is consistently ranked first among Irish universities (e.g. QS 2019; THE 2018) and was ranked 104<sup>th</sup> in the World across all indicators in the 2019 QS rankings.

Applications should be submitted within a single PDF document that includes a CV with educational history, transcripts of degree results, a short (1-2 page) letter of motivation and contact details for 2 referees. The motivation letter should clearly state how the applicant's research interests and skills relate to the research project outlined above. Applications will not be considered complete until referees have submitted their references. If the successful candidate does not have English as a first language, they will also be required to submit evidence of English language competence at this stage.

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Interested applicants are requested to contact Dr. Marta Martins ([mmartins@tcd.ie](mailto:mmartins@tcd.ie)), for more information on the specific project, and to consult the Trinity's Graduate Studies website for questions on admissions or other logistics: [www.tcd.ie/economics/postgraduate/research-degrees](http://www.tcd.ie/economics/postgraduate/research-degrees).

We are looking for applicants with the following qualifications:

### **Essential:**



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- A first-class (or equivalent) undergraduate degree in microbiology, or biotechnology, or another discipline directly relevant to the topic
- Excellent communicative (written and oral) competence in English
- Excellent research, protocol design, and organisational skills
- Ability to work and drive to field locations (ability to drive in Ireland, and/or complete license exam by start of PhD position)
- Be a pro-active, self-directed individual and able to work alone as well as part of a team in a collaborative, structured environment

**Desirable:**

- A Master's degree (completed or in progress) in microbiology or molecular microbiology, or related discipline directly relevant to the topic
- Demonstrable experience of using sequencing technologies and experience in molecular biology
- Demonstrable experience of using software for bioinformatics analysis of bacterial sequences (genes, genomes, transposons, etc)
- Demonstrable experience of performing cell culture and toxicity assays
- Demonstrable experience of performing statistical analysis (use of Excel, GraphPad, etc)
- Familiarity with techniques such as flow cytometry, imaging, etc
- Evidence of publication (or in press) in international peer-reviewed journals
- Willingness to integrate the activities of the Department of Microbiology

**Further enquiries:**

Dr. Marta Martins (mmartins@tcd.ie)



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## **Funded PhD-position *Treatment technology for nutrient abatement in agricultural drainage networks***

Applications are sought for a fully-funded four-year PhD position to work on the project *Treatment Technology for Nutrient Reduction in Agricultural Drainage Networks* under the supervision of Dr David O'Connell. Seasonal changes in plant growth, biomass and microbial growth will limit the all year around effectiveness of Vegetative buffer strips (VBS) to protect agricultural catchment streams from nutrient laden surface water runoff, hence it is important to consider the integration of passive in-channel end treatment technologies to achieve optimum results. This project will focus on practical end-treatment technologies. These systems have some intrinsic drawbacks which limit their application including long hydraulic retention time (HRT), a large footprint, and substrate clogging. This PhD project will focus on the design and develop of passive in-channel technologies to augment the nutrient mitigation capacity of VBSs. The project will include but not be limited to studies on the capability of different materials to sorb nutrients, design and develop reactor systems, investigate, assess and optimize the microbial function of the system for it to be applied at the pilot scale.

This award provides a unique opportunity for a doctoral student to pursue interdisciplinary research in the thriving intellectual community at Trinity College Dublin. Based in the School of Engineering and enrolled in the Structured PhD Programme, the PhD student work closely with the other researchers involved in *NuReCycle*.

*NuReCycle* is interdisciplinary project that explores factors driving diffuse water pollution from agricultural sources in Ireland and seeks to develop integrated nutrient control, recovery and recycling systems. The project is generously funded by a Kinsella Challenge-based E3 Multi-disciplinary Project Award.

The start date for this position is 1<sup>st</sup> March 2022.

### *Applications*

Applications can be made [by clicking here](#) on or before the 30<sup>th</sup> November 2021.

Applications should be submitted within a single PDF document that includes a CV with educational history, transcripts of degree results, a short (1-2 page) letter of motivation and contact details for 2 referees. The motivation letter should clearly state how the applicant's research interests and skills relate to the research project outlined above. Applications will not be considered complete until referees have submitted their references. If the successful candidate does not have English as a first language, they will also be required to submit evidence of English language competence at this stage.

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body. Trinity's Diversity Statement can be viewed in full at <https://www.tcd.ie/diversity-inclusion/diversity-statement>

We are looking for applicants with the following qualifications:

**Essential:**

- A first-class (or equivalent) or 2:1 honours undergraduate degree in Environmental or Process Engineering or another discipline directly relevant to the topic.
- Strong skills in water treatment laboratory, bench scale and pilot scale studies.
- Ability to work and drive to field locations (ability to drive in Ireland, and/or complete license exam by start of PhD position).
- Excellent communicative competence in English
- Excellent research and organisational skills
- Be a self-directed individual with initiative and able to work in a collaborative, structured environment.

**Desirable:**

- A Master's degree (completed or in progress) in environmental, chemical or process engineering
- Demonstrable experience of pursuing water research, familiarity with water analysis, wastewater process design, laboratory and pilot scale systems, materials analysis techniques and a distinct openness towards interdisciplinary collaboration.
- Willingness to contribute to the activities of the School of Engineering.

**Further enquiries:**

Dr David O'Connell (david.oconnell@tcd.ie)



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### **Funded PhD-position: *Agricultural pollution in Ireland: Environmental history of a contemporary challenge***

Applicants are sought for a fully-funded four-year PhD position to work on the project *Agricultural pollution in Ireland: Environmental history of a contemporary challenge* under the supervision of Dr Katja Bruisch. This project takes a historical perspective to studying the complex and unintended environmental impact of intensive farming with a particular focus on water, soil and biodiversity. It will explore the political, economic and social factors underpinning agricultural pollution in recent decades and examine environmental changes related to practices such as extensive fertilizer use and manure-spreading. The project will also focus on the farming community and study controversies around, resistance against, and alternative approaches to agricultural practices that cause pollution or biodiversity decline. The project will involve extensive archival and oral history research, while also engaging with the fieldwork carried out under the umbrella of the *NuReCycle*-project. The aim of this PhD project is to situate Irish agriculture in a broader history of food, farming and the environment in the late 20<sup>th</sup>/ early 21<sup>st</sup> centuries. It is also meant to provide historical context to understand current challenges to implementing more sustainable farming practices in the Republic of Ireland.

This award provides a unique opportunity for a doctoral student to pursue interdisciplinary research in the thriving intellectual community at Trinity College Dublin. Based in the School of Histories and Humanities and enrolled in the Structured PhD Programme, the PhD student work closely with the other researchers involved in *NuReCycle*.

*NuReCycle* is interdisciplinary project that explores factors driving diffuse water pollution from agricultural sources in Ireland and seeks to develop integrated nutrient control, recovery and recycling systems. The project is generously funded by a Kinsella Challenge-based E3 Multi-disciplinary Project Award.

The start date for this position is 15 October 2021.

#### *Applications*

Applications can be made [by clicking here](#) on or before the 31<sup>st</sup> August 2021.

Applications should be submitted within a single PDF document that includes a CV with educational history, transcripts of degree results, a short (1-2 page) letter of motivation and contact details for 2 referees. The motivation letter should clearly state how the applicant's research interests and skills relate to the research project outlined above. Applications will not be considered complete until referees have submitted their references. If the successful candidate does not have English as a first language, they will also be required to submit evidence of English language competence at this stage.

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We are looking for applicants with the following qualifications:

**Essential:**

- A first-class (or equivalent) undergraduate degree in History or another discipline directly relevant to the topic
- Excellent communicative competence in English
- Excellent research and organisational skills
- Be a self-directed individual and able to work in a collaborative, structured environment

**Desirable:**

- A Master's degree (completed or in progress) in modern or environmental history
- Demonstrable experience of pursuing historical research, familiarity with oral history approaches and openness towards interdisciplinary collaboration
- Willingness to contribute to the activities of the Trinity Centre for Environmental Humanities

**Further enquiries:**

Dr Katja Bruisch (BRUISCHK@tcd.ie)