PhD Studentship: Treatment of solid and semi-solid end-of-process meat processing material by Anaerobic Digestion and Pyrolysis

University College / Management Unit	College of Health and Agricultural Science
University School / Unit	School of Agriculture and Food Science
Post title	PhD
Project	Treatment of solid and semi-solid end-of-process meat processing material by Anaerobic Digestion and Pyrolysis
Post duration	4 years
Supervisors / Mentors	Prof James Lyng and Dr Ajay Menon
Main location for project	UCD (with TUS for Pyrolysis)
Provisional start date	01/09/2024
Funding source	This project is funded by the DAFM Circoval – Circular Bovine and Ovine Co-products valorisation project and is aligned to the BiOrbic Food Waste Challenge
Salary	€22,000 tax free per annum plus university fees

Summary

The overall objective is demonstrating the utilisation of semi-solid by-products and effluents created by the meat industry and the valorisation by CirCoVal's concept by anaerobic digestion (AD) and pyrolysis to create renewable energy in the form of biogas and carbon sequestration via pyrolytic product-based soil additive. The anaerobic digestion will be carried out in a bespoke, optimised phase separated system which would be optimised to process a wide variety of substrates. This will be upscaled to a 1000L TRL 7 system along with the creation of a detailed mass flow and techno-economic model and a digital twin of the system to aide large scale implementation.

The outputs from the project can feed into regional strategic plans such as The Regional Spatial and Economic Strategy (RSES)[12] for the Eastern and Midland Region which is a strategic plan identifying regional assets, opportunities and pressures and provides appropriate policy responses in the form of Regional Policy Objectives. At this strategic level it provides a framework for investment to better manage spatial planning and economic development to sustainably grow the Region to 2031 and beyond.

The EU bioeconomy strategy is part of the wider EU Green deal which is steering Europe through a just transition to a sustainable society. The benefits of this project are in line with those of EU Green Deal, i.e.to generate cutting-edge clean technological innovation, future-proofing jobs and skills training for the transition, and ensuring globally competitive and resilient industry. Building on the past research to valorise the by-products of meat production and demonstrating scale up of these processes from Teagasc, UCD, UCC and TUS will showcase the potential locked in a low-value meat co-products and the necessity of a pilot scale research alongside the laboratory developments. The pilot

facilities provide industry with the platform to test and scale technologies, produce prototype products for market testing, validation and to demonstrate to investors the viability of their market offering.

Objectives

1. To characterise substrates from meat coproducts processing and optimise them as feedstocks for Anaerobic Digestion (AD) and Pyrolysis (PR)
2. To develop a unique and optimised phase separated AD process for converting end-of-cycle biomass from meat co-products valorisation processes into renewable energy via biogas generation
3. To develop an optimised pyrolysis process for converting end-of-cycle biomass from meat co-products valorisation processes and MBM into renewable energy via biochar and energy generation.
4. To scale up the system to 1000L and demonstrate at TRL 6 operation
5. To carry out the mass flow and technoeconomic modelling of the entire co-product valorisation and value capture process and create a digital twin of the AD system

Requirements

A 2.1 or 1.1 degree at undergraduate level in Food Chemistry, Food Science, Food Technology, Biotechnology, Chemical Engineering, or a related discipline that has relevance to the aforementioned activities is essential. A relevant masters degree is desirable.

Knowledge, skills, experience

The successful candidate will be self-motivated with experience in working on research projects and will have: -

- Knowledge of meat, meat products meat processing and general food processing technologies
- Interest in and understanding of creation of circular systems in food production
- Knowledge of bioprocesses and modelling and understanding scaleup is desirable
- Experience in designing or operating of bioreactors or a basic understanding of bioprocesses
- Knowledge of microbiology and understanding of microbial communities is also desirable
- An interest in anaerobic digestion and biological treatment technologies
- Excellent written and oral communication and interpersonal skills
- Basic IT computational analysis skills
- Excellent qualitative and quantitative research skills
- An interest in innovation and willingness to work with meat and meat products

Application Procedure

Applicants should submit in one document: a cover letter setting out your motivation for applying for the role and how your skills meet the requirements set out in this document AND a full Curriculum Vitae to include the names and contact details of 2 referees (including email addresses), by July 31st 2024 Noon (GMT) to:- Professor James Lyng Email: james.lyng@ucd.ie and Dr Ajay Menon Email: ajay.menon@ucd.ie

This project has received funding from the Department of Agriculture Food and the Marine (DAFM) 2023 Policy & Strategic Studies Research Call under grant agreement reference: 2023RP1040.

This project is aligned to BiOrbic, Ireland's National Bioeconomy Centre. BiOrbic is a national collaboration of researchers, focused on the development of a sustainable, circular economy. Encompassing 100+ researchers from twelve institutions in Ireland, along with International collaborators, BiOrbic is focused on training and developing the next generation of Bioeconomy leaders.