PhD Project Advertisement

Project No/title: FBS2026 76 Theodoridou qr / *Sustainable Use of Regional Agricultural By products to Minimize Greenhouse Gas and Ammonia Emissions from Ruminants*

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Project Details

The UK Climate Change Act (2008) mandates net-zero carbon by 2050, with Northern Ireland (NI) contributing 4.7% of UK emissions in 2023, largely from agriculture (30.8%), including 18% from enteric fermentation. The NI Climate Change Act (2022) targets a 48% GHG reduction by 2030, requiring innovative solutions. Agro-industrial by-products, if not reused, pose environmental risks yet offer opportunities within a circular economy. Food-industry wastes contain nutrients and bioactive compounds (i.e. polyphenols) with antioxidant and methane-reducing properties. Integrating these by-products into ruminant diets could enhance animal health, productivity, and product quality while reducing emissions, feed costs, and overall environmental impact. Identifying specific local by-products and their bioactive compounds that mitigate GHG emissions supports natural feed formulation and a sustainable circular agri-food system in NI. Re-utilising food-industry by-products in animal feed also improves waste management, food security, and feed efficiency while reducing competition with human-edible foods and supporting the One Health framework.

Research aims: Project assesses local food-industry by-products as ruminant feed supplements to reduce greenhouse gas and ammonia emissions. Using integrated multi-omics, it identifies bioactive compounds linked to mitigation. Metagenomic analysis explores mechanisms by which these compounds modulate the rumen microbiome and influence animal performance, product safety, and quality in this study.

What you will do: (1) Ensiling studies will use local food-industry by-products to determine optimal ensiling methods that enhance nutritional value for ruminant feed while monitoring changes in bioactive compounds and dietary components across different ensiling options. (2) In vitro experiments will assess the effects of ensiling on nutritive value and the mitigation of methane and ammonia emissions, identifying the most effective ensiling method for silage quality and emission reduction. Screening using RUSITEC or batch cultures will select the most effective wastes and combinations under varying dietary conditions. (3) Rumen microbiome responses and the bioactivity of by-product–derived compounds linked to emission reductions will be characterised in vitro. (4) Opportunity for animal feeding trials to evaluate feed intake, growth, nutrient use, blood metabolites, methane production, rumen function, welfare, health, product quality, and N_2O, CH_4, and NH_3 emissions from slurries. (5) Multi-omics profiling will identify bioactive compounds driving microbiome and emission responses

References:

Student profile

Essential for project: A background in animal science, veterinary, food science, or biology, and a foundational understanding of animal nutrition, physiology, dairy science, laboratory analyses, and omics technologies.

Desirable for project: Data/statistical analysis skills, along with experience in fermentation models, chromatography, microbiome analysis, or animal trials, are beneficial but not required, as the student will receive training in these areas

All FoodBioSystems applicants: An upper 2nd class degree (or equivalent) in a subject relevant to the project.

Candidates with a lower class of Bachelors degree, but merit or above at Masters level will also be considered**.** **D**emonstrable skills in problem-solving, team-working, communication and time management.

Training

Project specific training opportunities: Training will be provided via all partners and will cover cross-disciplinary transferable skills to enhance student's future career prospects. The student will have animal nutrition related training on analytical methods: i) feed chemical composition (i.e. protein, fibre), ii) determination of the feed bioactive compounds iii) silage quality iv) in vitro gas production technique and training on rumen microbiome analysis, including DNA extraction, 16S rRNA sequencing. Also, will be trained for (i) fatty acid and mineral profiling of by-products, and rumen fluid using gas chromatography. QUB offer a Careers Development Programme where student can participate in a range of interactive workshops covering communicating postgraduate research skills to employers, effective academic applications, preparing for job interviews and research student can drop in at the Graduate School with a draft CV or application and get advice on how best to present relevant skills and experience.

FoodBioSystems training opportunities: Throughout their studentship, all FoodBioSystems doctoral researchers participate in cohort training that covers four key themes: food systems, big data (data analytics and modelling), business, and research fundamentals. All doctoral researchers complete a placement: either project-related with a non-academic (CASE) partner, or unrelated to the project and outside the academic environment (PIPS). Details of training are available on the DTP website: https://research.reading.ac.uk/foodbiosystems/training/.

Project supervision style

The student will be supervised by a primary supervisor (QUB), supported by the rest two co-supervisors from UREAD and QUB, combining complementary expertise in nutrition, microbiome, multi-omics and feed evaluation. Weekly one-to-one meetings with the supervisor overseeing each project component will monitor progress, provide technical guidance, and address any challenges. Monthly virtual meetings involving the full supervisory team will ensure effective coordination between institutions and integration of all research elements. During the student's training period at UREAD, additional in-person sessions with QUB supervisors will offer advanced support in microbiome techniques, bioinformatics, and data interpretation. Formal progress reviews will take place at the end of each project phase, with outcomes used to refine the research plan and training objectives. The student will participate in regular lab meetings at UREAD and QUB to enhance presentation, communication, and collaborative skills. Constructive written feedback will be provided within two weeks, or sooner when required.

Stipend (Salary)

FoodBioSystems DTP students receive an annual tax-free stipend (salary) that is paid in instalments throughout the year. For 2025/26 this is £20,780 and it will increase slightly each year at rate set by UKRI.

Equity Diversity and Inclusion

The FoodBioSystems DTP is committed to equity, diversity and inclusion (EDI), to building a doctoral researcher (DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the FoodBioSystems DTP website and include:

- Offering reasonable adjustments at interview for shortlisted candidates who have disclosed a disability or specific learning difference.
- Guaranteed interview and applicant mentoring schemes for applicants, with UK home fees status, from eligible under-represented ethnic groups who also meet academic eligibility criteria and the student profile essential for the project.

These are opt-in processes**.**

Our studentships can be offered to home students on a part-time basis, and studentship end date and stipend payments will be amended to reflect the part-time registration. The minimum registration for DTP funded part-time students is 0.5 FTE (studying an average of 20 hours per week over 8 years). We regret that part time registration is not available to international students due to complexities of visa restrictions.

Funding note

We welcome applications from candidates with Home/ROI fees and international fees status. This studentship is funded by UKRI and covers stipend, fees at Home/ROI rate, and research costs. The host university will not charge UKRI funded international students the difference between Home/ROI fees and international fees.

Costs that must be found from other sources or met by the individual student include: visa fees, healthcare surcharge, relocation costs and guarantor services.

For up to date information on funding eligibility, studentship rates and part-time registration, please visit the FoodBioSystems website.