

## FoodBioSystems DTP - PhD Project Advertisement

### Project Title:

FBS2021-41-Theodoridou: Seaweed: A natural approach to improve productivity of dairy cattle and reduce environmental emissions

### Lead Supervisor:

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### Co-supervisors:

Dr Sokratis Stergiadis, University of Reading (URE), School of Agriculture, Policy and Development

Prof Sharon Huws, Queens University Belfast (QUB), School of Biological Sciences

Dr Tianhai Yan, Agri-Food and Biosciences Institute, Sustainable Agri-Food Sciences Division (AFBI)

### Project Description:

Food security is a global challenge and as overall demand for food increases, there is an urgent need to increase the protein supply protein from sustainable sources. Currently more than 80% of the protein requirements for livestock rearing in the EU is imported from non-EU countries. At the same time climate-induced shifts will increase the cost of animal protein and feed due to an increased demand for land and water.

Seaweeds are the most potent aquatic source which can contribute to freeing up land to grow crops for direct consumption by the human and. Brown seaweeds are a promising animal feed due to suitable amino acid profile, trace elements, vitamins and bioactive compounds (i.e. phlorotannins), while have antioxidant and antimicrobial activities. They can also add value to the ruminant production systems by reducing emissions, improve animal's productivity and the quality of animal products. Seaweed supplements in livestock are considered a way to increase iodine content of animal products, which is a good way to provide iodine to deficient human populations.

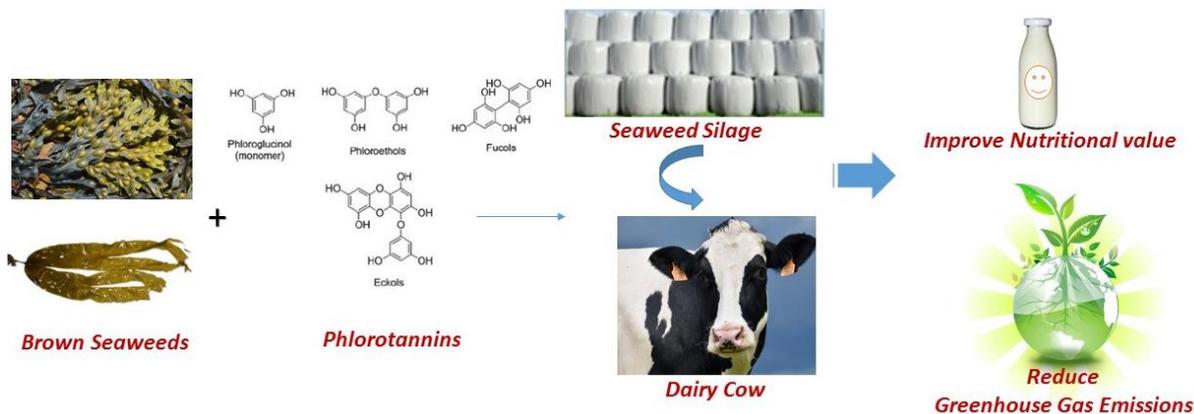
### The project aim:

Evaluate the nutritive value of seaweed silage and assess its potential to 1) improve nitrogen use efficiency in dairy cows; 2) improve milk quality and b) reduce methane emissions.

Main challenges of using seaweed are the high mineral content, which restricts its inclusion rate, and the difficulties in preserving and transporting at the farm.

This PhD will respond to these challenges with the development of seaweed silage and this will be achieved via the following 4 research studies:

- 1) **Assess *in vitro* the effect of seaweed on rumen fermentation.** Brown seaweed species will be screened and measure gas production, volatile fatty acids, ammonia and digestibility. This study will take place at Queen's University Belfast.
- 2) **Optimize the seaweed ensiling process.** Two seaweed species with the most potent ammonia and methane, inhibitory properties will be selected. Seaweed silage will be prepared the most efficient ensiling method will be used to prepare silage for the animal trials. This study will take place at Queen's University Belfast.
- 3) **Access the effect of seaweed silage inclusion in the diet of dairy cattle** on feed intake, milk production, nutrient digestibility, energy and nitrogen utilization efficiency and methane emissions. This animal trial that will take place at Agri-Food and Biosciences Institute (AFBI) in N. Ireland.
- 4) **Reveal how rumen microbes influence metabolic pathways related to N use efficiency and milk quality.** This study includes, milk composition analysis, fatty acid profiling of the milk which will take place at University of Reading and metagenomics at Queen's university. Belfast.



## Unique Skills Training

Student will get a unique multidisciplinary training in:

### SCIENTIFIC SKILLS

#### Queen's University Belfast:

1) Analytical methods for feed biochemical profile; 2) *in vitro* gas production techniques; 3) metataxonomic and metagenomic sample processing; 4) Sequencing and downstream analysis.

#### University of Reading (6-month visit):

1) Gas chromatography techniques for fatty acid profile of milk, feed and rumen fluid;  
 2) metabolomics analyses of the NMR spectral data by supervised OPLS-DA, cross validation and response permutation tests to assess predictive accuracy (SIMCA), and metabolite annotation; 3) correlation of metabolites on metabolic pathways (KEGG).

#### Agri-Food and Biosciences Institute (6-month placement):

1) Animal Trials experience. Data and sample collection in animal metabolism trials and operation of calorimetric chambers.

### SOFT SKILLS

#### Queen's University Belfast:

Careers Development Programme include interactive workshops-communicating research skills to employers, effective academic applications, preparing for job interviews-.

## Student profile

This project would be suitable for students who have an upper second class degree in a related science (e.g. animal science, veterinary, food science, biology), and a keen interest in animal nutrition/physiology, dairy science, laboratory analyses, -omics technologies and/or bioinformatics. Good skills on reviewing literature, attention to detail, time-management, organisation, teamwork and independent learning, are also required. An MSc in relevant science would be advantageous, but not essential.

## Funding

This project has as co-sponsorship the Agri-Food and Biosciences Institute in N. Ireland.

The project is part of the FoodBioSystems BBSRC Doctoral Training Partnership (DTP), it will be funded subject to a competition to identify the strongest applicants.

The studentship is open to UK and international students (including EU countries) however due to funding rules, no more than 30% of the projects can be allocated to international students.

The funding will include a tax free stipend (minimum £15, 285 per year), support for tuition fees at the standard UK rate (currently £4,407 per year) and a contribution towards research costs. **Please note** that the host universities have not yet confirmed the level of fees charged to international students funded by the DTP. Fee levels may vary across the institutions. This information will be shared on the FoodBioSystems DTP website as soon as it becomes available.

## To apply

Please go to [FoodBioSystems DTP website](#) for information on how to apply for this studentship. The closing date for applications will be 8 February 2021.