PhD Project Advertisement

Project title: Multi-omics approach to predict economically important health and production traits in sheep

Project No: FBS2022-48-Mooney-qa

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Project description:

Sheep production plays an important role in the UK agri-food sector employing around 35,000 people on farm with a further 120,000 allied jobs. The number of sheep in the UK is estimated at 22 million heads in 2019 (DEFRA), including a reported 2 million in Northern Ireland (DAERA). Due to small commercial herd size, UK farmers have to rely on using breeding programmes from breed societies and pedigree breeders to improve efficiency, sustainability and profitability of sheep production to address the challenge of producing enough food in a sustainable system to feed the growing global population.

Within animal breeding, recording health, efficiency, and quality of production traits can be expensive and "hard to measure", requiring specialised equipment and is often time consuming. Therefore utilizing proxy traits which are easy to record, trait-specific and highly correlated with the target traits, will help accelerate genetic progress in breeding programmes. Progress in bioanalysis demonstrates that metabolites which reflect complex phenotypes at the molecular level can be used as the proxies for "hard to measure" phenotypes and diseases.

The main hypothesis of this project is to identify metabolites as the targeted proxies for "hard to measure" phenotypes and to develop novel statistical models that can predict economically important traits in sheep, namely health records (e.g. liver fluke and other parasite burdens), and carcass characteristics (e.g. weight gain and meat quality) in lambs. The ultimate aim is to develop multi-omics predictive tools that can be applied at a commercial farm level. The project will apply multi-disciplinary approaches including genomics, bioinformatics, metabolomics, big data analysis, statistical modelling, and functional biology to enhance sustainability in animal production.

Training opportunities:

The student will have the opportunity to work with researchers in Queen's University Belfast, Aberystwyth University and Agri-Food and Biosciences Institute (AFBI) and benefit from research underpinned by strong applied and industrial-focused collaboration, contributing to transferable and professional skill development in preparation for a career within academia, industry or the policy sector. The student will benefit from QUB involvement in the QUADRAT NERC DTP facilitating additional training (e.g. data analytics) and opportunities for cross-disciplinary interaction. The QUB Postgraduate Research Development Programme will develop transferable skillsets whilst QUB/AFBI will provide bespoke training in quantitative genetics, bioinformatics and genome and metabolomics data analysis, with the opportunity to enrol on relevant components of PGT modules at QUB and Aberystwyth University. The research infrastructure, scientific expertise, and regional

diversity that this project encompasses aims to train a data analytic scientist with the unique skillsets and expertise needed to address a spectrum of research questions within the agri-food and animal health field. As a CASE studentship, the project provides a unique opportunity for the student to work directly with AFBI and learn about the needs and research gaps of agri-food, and how research can address these needs through both governmental and commercially directed research.

Student profile:

This project would suit a student with good quantitative skills and a strong interest in modelling biological systems with a degree in Biological Sciences, Computer Sciences, Statistical Sciences or similar. Demonstrable knowledge of biology, with some research experience in at least one of (1) quantitative genetics, (2) bioinformatics, (3) metabolomics, or (4) data sciences would be an advantage.

Funding particulars:

This project is supported by AFBI whose work can be summarised as Leading Improvements in the Agriculture Industry, Enhancing the natural and marine environments and Protecting animal, plant and human health.

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