PhD research opportunities

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Based at Ellinbank SmartFarm and AgriBio, the Centre for AgriBiosciences, Melbourne

Successful applicants must meet the La Trobe University entry requirements for a Doctor of Philosophy degree.

Check your eligibility here:

https://www.latrobe.edu.au/study/apply/research/ doctor

For enquiries and to apply, please forward a covering letter, your curriculum vitae (please include evidence of research writing) and academic transcripts to:

Kendra Whiteman
Higher Education Manager
Agriculture Victoria Research
kendra.whiteman@agriculture.vic.gov.au

Closing date for applications: Until filled.

PhD Dairy Soils research program:

Optimising predictions of pasture dynamics through enhanced soil attribution

Understanding and managing interactions between climate, soil, pasture and grazing animals remains a key challenge for pasture-based livestock production systems. These interactions are dynamic, influenced by variables such as weather patterns, soil moisture, fertility, and grazing pressure. This project will develop and validate approaches for creating high-resolution spatial soil datasets and characterising landscape evolution processes. These datasets will be integrated with biophysical models to predict pasture growth dynamics to better inform paddock and farm management decision making.

Predicting manure properties for precise nutrient application.

Manures are an important, but under utilised and undervalued nutrient source on dairy farms. Tools are required to precisely manage manure nutrient applications to gain optimal value from this resource. This project aims to develop predictive relationships for manure nutrients, focusing on technologies suitable for use in pasture-based systems. The project will apply chemical, analytical and spectral approaches to the analysis of manure. Data science and tools such as machine learning and chemometrics will support the prediction of manure nutrient concentrations.

Digital Characterisation and Modelling of Temporal and Spatial Aspects of Root Growth.

This project will involve the development of data visualisation and analytical tools to allow the non-destructive measurement of root growth dynamics in perennial pastures across seasons and in response to agronomic interventions such as the addition of organic ameliorants to soil. The spatial and temporal data related to the dynamics of root growth under perennial pasture will be used to support pasture growth modelling to relate root growth to above-ground biomass growth and pasture persistence.

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PhD Dairy Soils research program (cont....):

Impact of farm management on soil moisture retrieval from satellite imagery

Effective management of complex farm systems requires timely, accurate, cost-effective and repeatable information that can be integrated into farm operations. Remote sensing technologies, particularly satellite imagery, are increasingly used to provide this type of information. Soil moisture information is a key dataset for understanding pasture growth and optimizing farm productivity but is often not readily available and difficult to measure with precision. Quantifying temporal and spatial changes in soil moisture at paddock and sub-paddock scales is useful yet challenging to measure.

This project will look explore sensor fusion approaches, advanced calibration techniques, machine learning and AI, and temporal data integration to quantify the impacts of farm management on soil moisture.

Nutrient retention and recovery from manures

Dairy cows utilise less than 30% percent of ingested nutrients to produce milk, with the remainder excreted. Consequently, manure is the single largest source of nutrients on commercial dairy farms. Nutrients, such as nitrogen (N), are at risk of loss as ammonia (NH3) and nitrous oxide (N2O) through gaseous emissions from manures.

To investigate effectiveness of various chemical and physical treatments to retain and recover nutrients from manure, this project will seek to characterise nutrient transformations, quantifying direct and indirect greenhouse gas emissions of manure in storage, and measuring nutrient use efficiency and losses when treated manure is applied to land.

Soil microbial similarity of the transcriptome results from the glasshouse to those in the field experiments

This project will investigate the rhizosphere (and possibly plant root) and rhizosphere transcriptome over time in contrasting soil types. The project will also use greenhouse plants to undertake select simulation experiments in the glasshouse and compare these with field studies.

Assess the performance of N fixing and P solubilising microbes

To assess the performance of N fixing and P solubilising microbes in field experiments, this project will undertake glasshouse-based studies with selected microbes on perennial ryegrass plants as preliminary experiments prior to undertaking filed-based studies. Techniques such as meta-genomics, and meta-transcriptomics as well as targeted assays will be used to assess these microbes in glasshouse-based assays prior to the field testing.

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