PhD opportunity

Join a dynamic cross-disciplinary team as part of the Southern NSW Drought Resilient Mixed Farming System Trials project

We are seeking dynamic, motivated PhD students to join our team on the Southern NSW Drought Resilient Mixed Farming System Trials research program from 2025.

There will be multiple opportunities available across:

- Geospatial science
- Systems modelling
- Crop and pasture science
- Soil science
- Economics
- Sheep production

For all inquiries, please send your CV and area of interest to the project lead, Dr. Shawn McGrath shmcgrath@csu.edu.au

About the Southern NSW Drought Resilient Mixed Farming System Trials

Mixed farming systems are the most common type of farm system in southern Australia and make up around 70% of farms in New South Wales (NSW). Mixed farms have separate grazing, cropping and livestock systems which require careful integration to optimise productivity. Careful integration of mixed farming systems is especially important during times of drought because a decision on one element of the system may disrupt the broader farm operation and impact the recovery of the landscape and business.

The Southern NSW Drought Resilient Mixed Farming System Trials project is led by Charles Sturt University (Gulbali Institute) in collaboration with the Southern NSW Innovation Hub and six farming systems groups in southern NSW. This project receives funding from the Australian Government's Future Drought Fund Long-term Trials of Drought Resilient Farming Practices program.

Find out more

Australian Government Department of Agriculture, Fisheries and Forestry | Future Drought Fund | SOUTHERN NSW Innovation Hub SUSTAINABLE AGRICULTURE, LANDSCAPES AND COMMUNITIES | Charles Sturt University Gulbali Institute Agriculture Water Environment

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PhD project 1

Drought Resilience in Mixed Farming: A spatial modelling approach for optimising integrated cropping and grazing systems

Project overview

This PhD project aims to investigate innovative, resilient, and transformational practices within mixed farming systems, focusing on drought resilience, soil protection, food security productivity optimization. By leveraging spatial modelling and integrating high-resolution geospatial data, this project will analyse four types of mixed farming practices to understand their impact on soil, crop, and livestock management during drought.

Mixed farming systems, which often include separate cropping, grazing, and livestock management, require careful integration to sustain productivity and soil health, especially during drought. Decisions made for any one component can influence the entire farm's performance, affecting soil quality and business resilience.

This project aims to characterize crop phenological stages to deepen understanding of crop-specific responses to drought at the farm scale, to then explore how different approaches to mixed farming influence productivity, economic value, and soil condition under varying climate conditions.

Project components

The study will be focused on trials of individual elements within four different farming practices commonly found on mixed farms: traditional mixed farming, integrated pasture legume and cropping, grazier-focused mixed farming and continuous cropping.

Key project components include:

- Drone-based Remote Sensing: High-resolution imagery captured by drones will offer detailed data on crop responses, crop phenological changes, soil condition and pasture quality in the study site. This imagery will be processed to extract metrics specific to each system's drought resilience, productivity, and soil condition.
- Soil Moisture Data Integration: Soil sensors will provide moisture data, which, when combined with phenological information, will yield insights into water stress impacts at different crop stages.

Project objectives

- Analyse Phenological Stage-Specific Drought Responses: Using spatial modelling, assess drought impacts across crop phenological stages within each system, identifying critical stages where intervention can most effectively sustain productivity and soil condition.
- Optimize Crop-Livestock Integration: Explore how synchronizing grazing and cropping cycles according to phenological data can optimize productivity.

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- Develop Decision Support Models: Create tools that integrate phenological and geospatial data, helping farmers adapt management practices at different crop stages to improve drought resilience.

PhD profile

The ideal candidate should have a strong background in:

- Soil sciences and/or crop science
- Spatial modelling: including data processing and analysis for creating and implementing different spatial modelling approaches
- Imagery processing and classification: including data extraction using commercial and open-source software and implanting different methodologies for image classification

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