MONDAY PLENARY SPEAKER

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Robust Models Don’t Grow on Equations (or Data) Alone

The challenges of process-based modelling of pastoral systems

Pastoral systems underpin global food security, supplying meat, milk, and fibre to billions while shaping agroecosystems across temperate, tropical, and arid regions. These systems integrate soil, plant, and animal processes with management interventions, influencing critical outcomes such as maintaining productivity, nutrient and greenhouse gas emissions, and biodiversity.

This presentation addresses challenges and opportunities in process-based modelling of grazing systems. Such models are grounded in biophysical principles, representing interactions among soil, vegetation, livestock, climate and management actions. They enable exploration of system-level trade-offs—e.g., optimizing productivity while minimizing nitrogen losses and emissions.

I will highlight advances in modelling fine-scale heterogeneity - a key driver of emergent behaviour in grazing systems. Finally, I argue that robust modelling requires more than equations and data: it demands rigorous software engineering practices, and testing frameworks that move beyond the current data-centric paradigm.