Project Update

P1e: Kikuyu nutritional value

July 2024

In Australia's grazing-based dairy systems, pasture utilisation is closely linked to profitability. Kikuyu is well-adapted to subtropical areas. It is fast growing but of moderate quality and generally perceived as a grass of poor nutritive value for dairy cattle. The Dairy UP team is working to change that.

The timing of grazing has a big impact on Kikuyu's nutritive value which affects pasture utilisation and profitability.

Kikuyu leaves lose quality very rapidly if not consumed at the right time, and the window of opportunity is generally smaller than for temperate grasses.

Grazing intervals also affect stem content. This matters because the nutritive value is affected by the proportion of the pasture that is made up of stems, leaves etc. Stems are more fibrous so the digestibility and nutritive value of kikuyu pasture is reduced if there's higher stem content.

Dairy UP research

This project aims to better understand and predict the rapid, short term daily changes in the nutritive quality of Kikuyu. This will enable the development of pasture management strategies to better manage the quality of Kikuyu pasture regrowth and prevent milk production losses due to the decline in nutritive value.

Unlocking the potential of Kikuyu

Dairy UP's P1 project aims to unlock the potential of Kikuyu pastures used by NSW dairy farmers. P1 is a suite of five projects that collectively explore new management options to grow and utilise more Kikuyu over summer and increase the productivity of Kikuyu-based pastures.

P1a: Remote pasture management using advanced sensing technologies

P1b: Antinutritional Factors (toxicity)

P1c: Genetic Variability

P1d: Carbon on NSW Dairy Farms

P1e: Kikuyu's Nutritive Value for Animals

This document provides an update on P1e.

Research approach

The Dairy UP team is modelling changes in the nutritive value of Kikuyu plants at different stages of regrowth. They are adapting a model originally developed for tall fescue and ryegrass.

Plot-scale, field experiments have been conducted in 2023 and 2024 to provide data to calibrate the model for Kikuyu.

Model

The model can simulate changes in leaf digestibility during regrowth at different leaf stages. It accounts for leaf growth, leaf age, leaf size and nutritive value (fibre content, fibre digestibility and metabolizable energy).

Field experiments

The first stage involved controlled field studies with small, replicated plots of Kikuyu under different growing conditions.

This enabled detailed assessment of plant morphology (structure) and nutritive value traits

including age and leaf length, leaf number per tiller, fibre (NDF, ADF) and digestibility (DMD and NDFD). This data is being used to quantify, model and predict the main factors affecting the fast decline in Kikuyu nutritive value during regrowth.

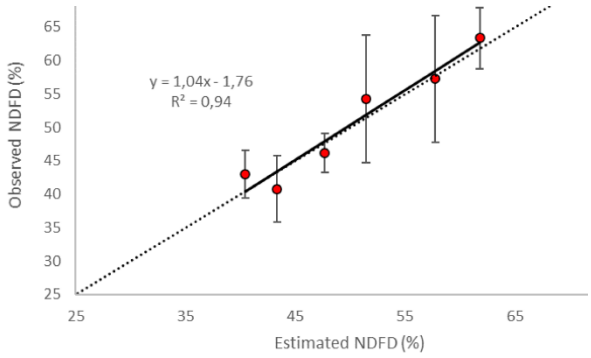
Progress update (July 2024)

Field experiments

Three (2022, 2023 and 2024) field experiments were conducted. The first two were used for model development and parametrisation. The last one was used to validate the model (compare the model predictions with the observed, independent, values/data).

Model

The model has been calibrated using data from the field trials. The quality sub-model has been validated and is very accurate (see graph). The model shows good accuracy of predicting the decline in digestibility associated with leaf stage.



Further work is underway to refine the sub-model for morphology (plant structure).

Factors affecting nutritive value

The main factors affecting nutritive value have been identified. Early results are consistent with previous studies, showing that the main factors affecting the nutritive value of Kikuyu are: leaf length, leaf age, senescence (leaf aging/decay).

Next steps

Future work is exploring the relationships between nutritive value data and yield to link changes in nutritive value (quality) with NDVI (satellite imagery), hopefully improving the efficacy of remote monitoring tools for farmers.

Related projects

Project P1e is using data from the Dairy UP's Remote Farm Monitoring Network (P1a) and from P1c: Exploring the genetic variability of Kikuyu.

The modelling work is based on earlier work that modelled changes in pasture fibre digestibility (Insua et al., 2019a) and integrated those changes with remote sensor-derived data of pasture biomass and growth (Insua et al 2019b).

Collaborators

The P2e project is a collaboration between the University of Sydney and the UIB, Argentina.

Read more

Insua J. R., Agnusdel M. G., Berone G. D., Basso B. and Machado C. F. (2019a) Modeling the nutritive value of defoliated tall fescue pastures based on leaf morphogenesis. Agronomy Journal, 111, 714-724.

Insua J. R., Utsumi S. and Basso B. (2019b) Assessing and modeling pasture growth under different nitrogen fertilizer and defoliation rates in Argentina and the United States. Agronomy Journal, 111, 702-713.

More info

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Delivery organisations

The University of Sydney – Dairy Research Foundation | NSW Department of Primary Industries | Scibus | Dairy Australia

Partner organisations

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