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Parameterisation of APSIM AgPasture for tropical pasture species; *Brachiaria* Mulato II and Gatton Panic

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Abstract: Tropical forages are the primary feed source for livestock production in tropical and subtropical regions, and their distribution is expected to expand further into more temperate regions due to climate change. Pasture models provide an effective means of assessing pasture growth, complementing costly field experiments by predicting the performance of forage species under diverse soil, climate, and management conditions. However, the application of these models in tropical regions has been limited, as they have not been widely parameterised and tested for tropical species. Jayasinghe et al. (2024) previously parameterised the DairyMod pasture model for two tropical species, Megathyrsus maximus 'Gatton Panic' (GP) and Brachiaria ruziziensis x B. decumbens x B. brizantha 'Brachiaria Mulato II' (BM). APSIM Next Generation is widely used for farming systems research, but its AgPasture module does not currently represent wide range of tropical pasture species. Given the shared modelling principles of DairyMod and AgPasture, this study aimed to translate DairyMod-derived species parameters into APSIM Next Generation to successfully simulate the growth of GP and BM.

Data for parameterisation were obtained from a field experiment at the Gatton Research Dairy, Queensland, Australia, which included measurements of herbage mass, canopy structure, photosynthesis, root traits, and tissue composition (N, non-structural carbohydrates, and lipid content). Species-specific parameters derived in DairyMod (v5.8.2) were incorporated into APSIM Next Generation AgPasture (v2025.09.7849) by modifying the existing C4 template (Rhodes grass) through a manager script. Following Johnson (2008), only species-specific parameters, such as photosynthetic traits, thermal responses, cold stress, allocation patterns, tissue turnover, root distribution, and leaf N dynamics were modified, while other generic C4 parameters were retained unchanged, assuming these physiological parameters do not significantly differ between C4 species. Climate data were sourced from an on-site automatic weather station, and soil information was obtained from site-specific measurements and supplemented with the APSoil database (Black Vertosol, Lawes No037). Management practices, including irrigation, fertiliser application, and pasture cutting, were represented through separate manager scripts. Model simulations reproduced aboveground biomass reasonably well, with R^2 of 0.68 and 0.72 for GP and BM, respectively, although these were lower than previously reported DairyMod fits. Biomass during the reproductive phase was poorly simulated, indicating limitations in the current parameterisation. Overall, the results demonstrate that AgPasture in APSIM Next Generation can represent new tropical pasture species when informed by species-specific data but further testing across diverse sites and seasons is required to refine parameter sets and improve predictive performance.

Keywords: *AgPasture, Brachiaria, Gatton Panic, Tropical pasture, DairyMod*

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