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Modelling dissolved inorganic nitrogen losses from the Queensland sugarcane industry

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Abstract: Agricultural development in Queensland catchments impacts on the health of UNESCO World Heritage-listed Great Barrier Reef (GBR) ecosystems (Waterhouse et al. 2024). The Paddock to Reef Integrated Monitoring, Modelling and Reporting Program was established to quantify these impacts, and to measure water quality improvements from changes to on-ground management practices (Australian and Queensland governments 2018).

The Queensland sugarcane industry covers 400,000 Ha and is a major contributor to pollutant losses, accounting for an estimated 42% of dissolved inorganic nitrogen (DIN) losses while covering 1.5% of the catchment area (McCloskey et al. 2021). To estimate DIN losses from sugarcane systems, APSIM models are configured to represent climates, soils and management across the region. Management practices include tillage, cover and fallow management, nutrient management, mill mud application, irrigation and recycling pit usage. APSIM outputs are integrated into catchment models to incorporate landscape processes and estimate end-of-system pollutant loads (McCloskey et al. 2021).

The APSIM models have recently been updated to reflect the latest science and knowledge of landscapes and sugarcane management. Improvements include the adoption of a new model for predicting losses of DIN in runoff (Vilas et al. 2022), a new suite of soil parameters, the incorporation of spatial management practice data, and a new nutrient management framework based around nitrogen use efficiency (Thorburn et al. 2022).

Outputs of the recent baseline model build indicate that 'edge of paddock' DIN losses from GBR sugarcane systems are over 700 t/yr via runoff, and over 5,600 t/yr in drainage. This presentation will discuss these findings in more detail, and will describe the model updates, key challenges faced, and opportunities for future improvements.

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