

Management of pasture termination can reduce soil nitrous oxide emissions in high rainfall cropping systems of South Eastern Australia.

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Nitrous oxide (N₂O) is a potent greenhouse gas. Agriculture accounts as the biggest contributor to the anthropogenic global N₂O budget. Emission of N₂O is also represent a loss of valuable plant-available nitrogen from the soil. For these reasons, there is a growing interest in quantifying losses of N₂O from agricultural soils and developing practical strategies for reducing N₂O losses.

This two-year field experiment evaluated the effect of conversion of long-term pasture to arable cropping on N₂O emissions in the High rainfall zone (HRZ) of south-west Victoria. Early termination (pasture terminated 6 months prior to sowing) followed by winter (ETw) and spring (ETs) crops and late pasture termination (pasture terminated one month before sowing) followed by a winter crop (LTw) were compared with continuous mown pasture (MP). Emissions of N₂O were measured continuously using the automated gas sampling and analysing system.

Emissions from MP were low throughout the study resulting in annual losses of 0.13 kg ha⁻¹ N₂O-N ha⁻¹. In the first year, annual losses from ETw and ETs plots were 7.1 kg ha⁻¹ and 3.6 kg N₂O-N ha⁻¹ respectively, while only 0.6 kg ha⁻¹ was lost from the LTw treatment. This trend was still noticeable in the second year of the study. High emissions were associated with N mineralisation and the accumulation of NO₃-N in the soil during the extensive fallow period after early pasture termination or wheat harvest. Soil water content was a key factor influencing the temporal fluctuations in N₂O emissions. Low emissions occurred when water filled pore space (WFPS) was less than 30% while high emissions occurred when the WFPS was above 65%, suggesting that denitrification was the major source of N₂O emission. Applying late rather than early pasture termination, and thus reducing the length of the fallow period, is a practical way of reducing N₂O emissions from mixed pasture/cropping systems.