Nitrous oxide emissions from a cropped soil in a semi-arid climate

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Understanding nitrous oxide (N_2O) emissions from agricultural soils in semi-arid regions is required to better understand global N_2O losses. Semi-arid and arid lands constitute one third of the global land area and are widely used for agricultural production. *In situ* measurements of N_2O emissions from semi-arid environments are limited in number, and mainly confined to irrigated cereal crops and rain-fed grasslands. Consequently, N_2O emissions were measured from a rain-fed, cropped soil in a semi-arid region of south-western Australia for one year. The site was ungrazed, and included N-fertilised (100 kg N ha^{-1} yr^{-1}) and non-fertilised plots. Emissions were measured using soil chambers connected to a fully automated system that measured N_2O using gas chromatography. Daily emissions ranged from -1.8–7.3 g N_2O-N ha^{-1} day^{-1}, and were greatest in the fallow period following a series of summer rainfall events. At this time soil conditions were ideal for soil microbial N_2O production: elevated soil water contents, available N, warm soil temperatures, and no active plant growth. The average annual loss was 0.10 kg N_2O-N ha^{-1}, and did not vary between N-fertiliser rates. Approximately 55% of the annual emission from both N treatments occurred following summer rain. The proportion of fertiliser N applied lost as N_2O-N after one year, and corrected for the 'background' (emission from non-fertilised treatment) was 0.02%. A second year of N_2O emissions measurements is currently being collected, and will preliminary results will be presented. To date, N_2O resulting from the direct addition of N fertiliser to rain-fed, cropped soils in semi-arid regions appear to be low. However, background N_2O emissions from cropped soils need to be accounted for in national inventories to fully assess the impact of agriculture on global N_2O emissions.