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Land use change and management of a Duric Histic Placaquand in Southern Chile: effects on biological properties and greenhouse gas emissions

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Aquands are shallow depth and frequently waterlogged volcanic ash soils, presenting seasonal dynamics of water content in the soil profile. Land use change and management are expected to alter the Aquands biological activity due to their impact to water/air relationships as well as nutrient dynamics and greenhouse gases emissions. In southern Chile (41°26'S;73°07'W; 70 m a.s.l.), soil biological processes related to C- and N cycles, as well as greenhouse gas effluxes were assessed in relation to historical land use change and a drainage set in a naturalized grassland for animal husbandry. Disturbed soil samples were obtained in order to evaluate soil respiration, N mineral dynamics (NH_4^+ and NO_3^-), denitrification, nitrate reductase activity. Static-closed chambers were installed in the field to assess fluxes of CO_2, N_2O and CH_4 from the soil surface at different seasons of the year with contrasting water table depths. Soil respiration responded to the historical land use change and draining effects. The aerobic and anaerobic biological processes related to soil nitrogen dynamics were less sensitive than respiration, and showed arbitrary effects according to the current use and management of the Aquand. Soil surface fluxes of greenhouse gases showed similar patterns, where CO_2 emissions responded temporarily to land use, while N_2O and CH_4 did not respond conclusively. The content of soil organic carbon associated to the structural changes derived from land use change (e.g. fire clearance) and soil management (e.g. animal trampling) are plausible parameters to explain the variations of CO_2 emissions from Aquand soils surface, while other elements such as microbial community and the ferrous wheel hypothesis, should be investigated in order to explain the biological responses and trace greenhouse gases emissions.