

# PHYSICAL-HYDRICAL ATTRIBUTES AND CO<sub>2</sub> EFFLUX FROM THE SOIL AS INDICATORS OF ENVIRONMENTAL SUSTAINABILITY IN PASTORAL SYSTEMS IN THE BRAZILIAN SEMI-ARID

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## Abstract

Soil degradation imposes significant environmental and economic impacts on the pastures of drylands worldwide, making livestock grazing systems often unsustainable under the present climate conditions. In this study, we aimed to compare the attributes of the soil of different grazing areas (pastures) using sensitive indicators of changes in the management of these areas, such as the physical-hydric properties and the CO<sub>2</sub> efflux (ECO<sub>2</sub>) from the soil. The study was carried out in three areas of enclosure grazing, understood by three land uses: a pasture of sabi grass (LU1), a silvopastoral system with sabi grass and tree legume (LU2), and an area with sabi grass and a herbaceous native legume (LU3). The measurements were undertaken over nine months and then grouped into three seasons (dry, transition, and rainy). The ECO<sub>2</sub> and the ten indicators of soil physical-hydric quality were measured: macroporosity, aeration capacity, plant-available water capacity (PAWC), relative field capacity (RFC), characteristic pore radius, quantity of hydraulically active pores, sorptivity, saturated hydraulic conductivity, soil density, and soil resistance to penetration. The soils in the LU1 and LU3 areas showed limited plant available water capacity ( $0.10 \text{ PAWC} < 0.15 \text{ cm}^3 \text{ cm}^{-3}$ ) and was soil water-limited ( $\text{RFC} < 0.6$ ). The advantages of using silvopastoral systems in semi-arid environments for environmental sustainability are not limited to improvements in the properties of soils, as these areas are also important carbon sinks.

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