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Application of an improved vegetation index from the visible spectrum in the diagnosis of degraded pastures: Implications for development

Thiago Quinaia[1], Renato Valle Junior[1], Victor Coelho[1], Rafael Cunha[1], Carlos Valera[2], Luís Sanches Fernandes[3], and F. A. L. Pacheco[3]

[1]Federal Institute of Education Science and Technology of Triângulo Mineiro
[2]Regional Coordination of the Environmental Justice Prosecutor's Office of the Paranaíba and Lower Rio Grande River Basins
[3]Universidade de Trás-os-Montes e Alto Douro

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Abstract

Inadequate pasture management causes land degradation and negative impacts on the socio-economic development of agricultural regions. Given the importance for Brazil and the World of pasture-based livestock production, the recognition of pasture degradation is essential. The use of remote sensing satellite systems to detect degraded pastures increased in the recent past, because of their capability to survey large portions of Earth's surface. A struggle nowadays is to improve detection accuracy and to implement high-resolution surveys at farmland scale using unmanned aerial vehicles (UAVs). The satellite sensors capture reflectance from the visible spectrum and near infrared bands, which allows estimating plant's vigor vegetation indices. The NDVI is a widely accepted index, but to generate an NDVI map using a UAV a relatively high-cost multispectral sensor is required, while most UAVs are equipped with low-cost RGB cameras. In the present study, a script developed on the Google Earth Engine image-processing platform manipulated images from the Landsat 8 satellite, and compared the performances of NDVI and an improved color index that we coined "Total Brightness Quotient" of red (TBQR), green (TBQG) and blue (TBQB) bands. An efficient detection of pasture degradation using the TBQs would be a good prognosis for the surveys at farm scale where environmental authorities are progressively using UAVs and forcing landowners towards pasture restoration. When compared to NDVI, the TBQG showed a correlation of 0.965 and an accuracy of 88.63%. Thus, the TBQG proved as efficient as the NDVI in the diagnosis of degraded pastures.

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