



Contents lists available at ScienceDirect

Computers and Electronics in Agriculture

journal homepage: www.elsevier.com/locate/compag

Original papers

The use of Sentinel 2 to quantify N, Ca, and K in walnut orchards

Maria Beatriz Mendes^a, Daniela Farinha^a, Pedro Oliveira^a, João Mota Barroso^b,
Luís Miguel Rato^c, Adélia Sousa^{d,*}, Ana Elisa Rato^{b,*}

^a MED – Mediterranean Institute for Agriculture Environment and Development & CHANGE – Global Change and Sustainability Institute, Instituto de Investigação e Formação Avançada, Universidade de Évora, Pólo Da Mitra, Ap. 94 7006-554 Évora, Portugal

^b MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Departamento de Fitotecnia, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo Da Mitra, Ap. 94 7006-554 Évora, Portugal

^c Centro ALGORITMI, VISTALab, LASI, Departamento de Informática, Escola de Ciências e Tecnologia, Universidade de Évora, Rua Romão Ramalho, n.º 59 7000-671, Évora, Portugal

^d MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Remote Sensing Laboratory - EaRSLab, Departamento de Engenharia Rural, Escola de Ciências e Tecnologia, Universidade de Évora, Ap. 94 7002-544 Évora, Portugal

ARTICLE INFO

Keywords:

Walnut
Nutrients
Remote sensing
MLR analysis

ABSTRACT

'Persian walnut' (*Juglans regia* L.) is one of the most consumed nut species in the world, and N, K, and Ca nutrition are critical for its growth and quality. Mineral nutrition management in fruit crops over large areas is a challenging task only possible with a remote sensing data approach and using rapid analytical methods to correlate remotely sensed data with ground data. This study aims to develop and validate predictive models for quantifying N, Ca, and K levels in 'Persian walnut' orchards using Sentinel-2 satellite data (9 different spectral bands and 2 vegetation indices (NDVI and NDWI)), addressing the challenge of large-scale nutrient management. The predictive models, using multivariate regression method, to predict N, Ca and K in walnut leaves, were satisfactory, with R^2 values of 0.70, 0.60 and 0.74, with RPD values of 2.2; 1.64 and 1.96 for respectively. Therefore, the results obtained indicate that remote sensing is a potential technology to assess the nutrient status in crops in a faster and simpler way than traditional plant leaf analysis procedures.