LIDAR sensor applied to olive trees

Dias, Ivo L.[1]; Dias, António B.[1,2]; Adélia M.O. Sousa[1,2]; Oliveira, Rui B.[3]

[1]MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Institute for Advanced Studies and Research, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal.
[2]Departmento de Engenharia Rural, University of Évora, Évora, Portugal
[3]Instituto de Ciências da Terra, Departamento de Física & Earth and Remote Sensing Laboratory – Earslab, Universidade de Évora, Évora, Portugal

In this study, we address a methodology for measuring olive tree canopies using LIDAR sensors. The orchard is managed in a super high-density system (SHD) with the Picual cultivar, located in Monforte, North of the Alentejo Region. The orchard was part of an experimental pruning trial, where, in the first treatment, the canopy was cut conventionally, and in the second treatment, selective pruning was implemented, sparing the new branches and the most flexible ones. This resulted in an expectedly dense and large canopy.

The sensor used was a fixed one that took several collections at different locations in all the space, which were then merged. Applying LIDAR technology enables detailed measurements of the weight and length of all sections of a tree, as well as the density of leaves and branches. This facilitates a comparison between the two treatments and their adaptability to the harvest machine.

Data were processed in CloudCompare (open source software), where the trees were normalized with respect to the ground points with those subsequently removed as they were unnecessary and too dense and heavy to work with. The outcome of this experiment is a point cloud in a LAS file, comprising nearly 2.5 million points with the x, y, z dimensions and corresponding georeferenced coordinates.

The results include the superficial area, volume, and limit points around the canopy. These parameters provide insights into the performance of the pruning and, in the future, the behaviour of different cultivars and biomass in olive orchard canopies.