

## Supplementary Materials

FAO-LCCS hierarchical classification system

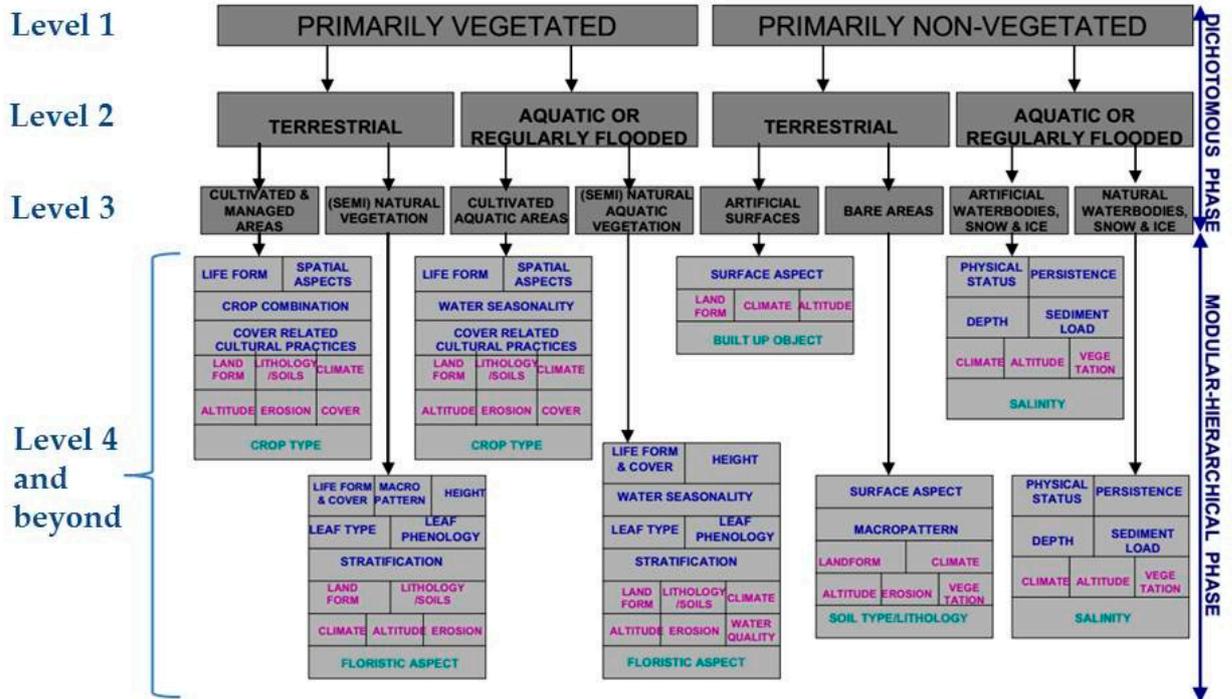


Figure S1. Overview of the Land Cover Classification System, its two phases and the classifiers.

## 1st Order Entropy as plant height proxy

FAO-LCCS taxonomy defines trees, shrubs and herbaceous life-forms according to vegetation height measurements. In this framework, vegetation having height lower than 0.5 m is defined as herbaceous, vegetation ranging from 0.5 to 3 m is characterized as shrubs, vegetation over 3 m is classified as trees.

The main method to derive vegetation height is through the use of Light Detection And Ranging (LIDAR). As well known, LIDAR can provide structural information by capturing the complete 3D structure of individual objects (e.g. vegetation height and density) [93]. LiDAR-derived Canopy Height Models (CHM) represent the calculated height of the vegetation above the ground surface. Thus, when available, CHM data can be integrated into the classification procedure in order to improve the final classification accuracy [35].

Although for the site under study LIDAR data were collected in 2014, in our study the data available were used only to validate the entropy measurements for the discrimination between low (herbaceous) and high vegetation (trees or shrubs). This choice was motivated, on the one hand, by the high costs of LIDAR acquisitions and, on the other hand, by the fact that LIDAR data are not regularly collected for the Mediterranean area. In view of these considerations, we performed herbaceous and woody vegetation, i.e., trees and shrubs, distinction through textural measurements.

Specifically, the entropy measure, calculated with a kernel window 3 by 3 pixels sized on the PostPoB image green band, resulted as the most suitable texture feature for the discrimination of herbaceous and woody vegetation. This finding is in agreement with the one reported in the recent literature [70, 75].

Figure 9 shows the average values of vegetation height obtained through CHM for each of the classes under consideration. The results reported in this figure indicate that the objects classified as herbaceous, by our algorithm, appear to have a height within the expected LCCS range. The same results were found in the measurements obtained for the woody classes.

In particular, the results reported indicate that:

1) cultivated woody classes (i.e., olive groves, orchards) have an average height lower than the one of natural woody vegetation. This finding is in agreement with vegetation structures in Murgia Alta;

2) A12/A1.D1.E2 (natural/woody.broadleaved.deciduous) class has lower heights compared to A12/A1.D2.E1 (natural/woody.needleleaved.evergreen) vegetation. This finding was expected because of the forest management plans in Murgia Alta;

3) A12/A1.D1.E1 (natural/woody.broadleaved.evergreen) class resulted to have an average height of about 6 m. This result seems rather unrealistic since this class consists mainly of *Quercus coccifera* L., and in Murgia Alta this species is known to hardly ever reach a height of 3 m. The rather high measurement obtained may be due to the misclassification between broadleaved and needleleaved evergreen woody vegetation. As already observed, this can be due to the weakness in applying a single rule for Leaf Type discrimination.

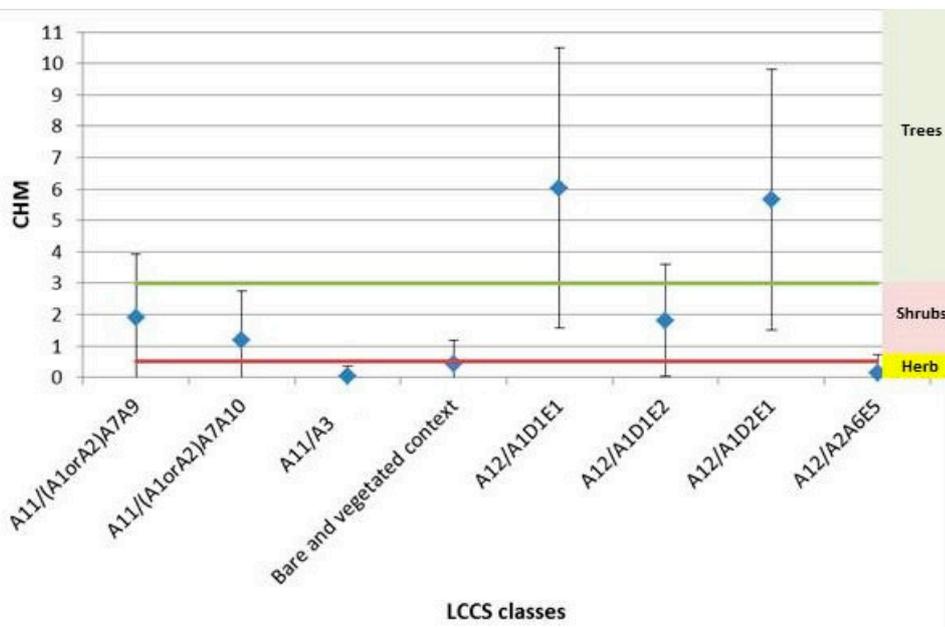
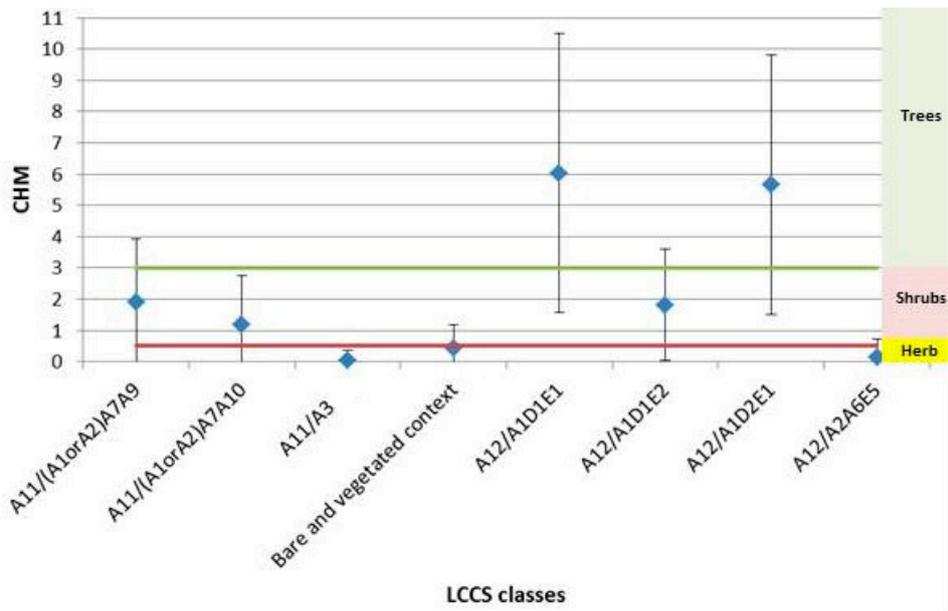


Figure S2. Average CHM measurements of vegetation classes