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UAV-based remote sensing in argan woodlands, Morocco

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The argan tree (Argania spinosa), a multipurpose tree endemic to southern Morocco, is particularly widespread in the catchment area of the Oued Souss. Due to the high grazing pressure (goats, sheep, dromedaries) on the North African woodland vegetation, it shows various species-specific browsing features such as density of basal cushions and mode of growth. The overall appearance ranges from trees with a large, round crown and a clearly visible trunk, over umbrella-shaped trees to heavily condensed cone-shaped cushions. An intensification of the grazing pressure is accompanied by an intensification of the feature characteristics.

The focus of this study is the classification of argan trees into different browsing intensities using unmanned aerial vehicle (UAV)-based remote sensing. Which criteria identifiable in small-format aerial photographs (SFAP) and photogrammetrically derived products are applicable to the classification of argan trees in terms of their browsing intensity? How many stages of degradation for Argania spinosa can be distinguished using SFAP and which parameters analysed by GIS techniques may be used to differentiate between them?

For this purpose, vertical and oblique imagery taken with a quadcopter UAV (DJI Phantom 4 Advanced+) are used to generate 3D point clouds as well as fine-resolution digital surface and terrain models (DSMs/DTMs) by means of Structure-from-Motion (SfM) photogrammetry. Respective tree heights are derived from normalized DSMs (nDSMs) or canopy height models (CHMs). In order to draw conclusions about their grazing pressure, the argan trees appearing in the DSMs are analysed and evaluated with regard to individual structural parameters such as crown shape, roughness of the crown surface, point-cloud density and curvature. Finally, the objective is to develop an appropriate classification method that will make it possible to map argan-tree browsing intensity solely using UAV-based remote sensing.