Estimating herbaceous aboveground biomass in Sahelian rangelands using structure from motion data collected on the ground and by UAV

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Abstract

1.Herbaceous aboveground biomass (HAB) is a key indicator of grassland vegetation and indirect estimation tools, such as remote sensing imagery, increase the potential for covering larger areas in a timely and cost-efficient way. Structure from motion (SfM) is an image analysis process that can create a 3D model from a set of images. 2: Computed from UAV and ground camera measurements, the SfM potential to estimate the herbaceous aboveground biomass in Sahelian rangelands was tested in this study. Both UAV and ground camera recordings were used at three different scales: temporal, landscape and national (across Senegal). All images were processed using PIX4D software and were used to extract vegetation indices and heights. 3: A random forest algorithm was used to estimate the HAB and the average estimation errors were around 150 g.m-^{2} for fresh mass (20% relative error) and 60 g.m-^{2} for dry mass (around 25% error). A comparison between different datasets revealed that the estimates based on camera data were slightly more accurate than those from UAV data. 4:It was also found that combining datasets across scales for the same type of tool (UAV or camera) could be a useful option for monitoring HAB in Sahelian rangelands or in other grassy ecosystem.

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