

Use of Remote Sensing Techniques to Enhance Forage Management: Unmanned Aerial Vehicles.

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Abstract:

The use of remotely piloted aircraft systems (RPAS) in agriculture has been the subject of intense research and development in the recent past. Likewise, the use of modified commercial digital cameras as colour-infrared sensors has opened new venues of opportunities for remote sensing applications within high spatial and temporal resolutions. This study examines the use of a RPAS and modified digital cameras as a tool for instantaneous measurement of forage biomass (dry matter per hectare) in a straightforward methodology – thus applicable to a farming operational scenario. Following such rationale, no radiometric or geometric calibration was performed nor incorporated to the process. The study was executed during July 2014, at Rannells Ranch (Kansas State University Experimental Station) on the Flint Hills, a Tallgrass Prairie at Manhattan, Kansas in the Great North American Plains. Despite the absence of geometric camera calibration, the digital surface model did not present any sort of significant distortion. None of the green, blue or near infrared channels were saturated despite dry matter levels above 5.000 kg per ha. Pixel values were not colour corrected by a reference target nor normalized during texture generation process (digital surface model process). The accuracy of a regression model between imagery data and biomass was assessed: results showed that there is a linear relationship ($r^2=0.80$) between a vegetation index (GNDVI) and standing biomass up until a breakpoint up to 3.500 kg DM/ha. Afterwards, the imagery was not fit to estimate marginal increments on biomass.