BIOMAP - MAPPING OF BIOMASS USING UAV

Anders K. Mortensen[1], Henrik Karstoft[2], Rasmus N. Jørgensen[3], René Larsen[4], Johannes R. Jørgensen[5], René Gislum[6]

1. Department of Agroecology – Crop Health, Faculty of Science and Technology, Aarhus University, Denmark. 2. Department of Engineering – Signal Processing, Faculty of Science and Technology, Aarhus University, Denmark. 3. Department of Engineering – Signal Processing, Faculty of Science and Technology, Aarhus University, Denmark. 4. Department of Agroecology – Climate and Water, Faculty of Science and Technology, Aarhus University, Denmark. 5. Department of Agroecology – Crop Health, Faculty of Science and Technology, Aarhus University, Denmark. 6. Department of Agroecology – Crop Health, Faculty of Science and Technology, Aarhus University, Denmark

ABSTRACT

Estimation of plant and crop biomass is an important parameter in environmental and agricultural science. Destructive analysis of biomass is time consuming and will therefore only be performed on a smaller part of the area. Another disadvantage of subsampling of the biomass is that it will not show the variation of biomass which is often equally important. Estimation of biomass using RGB images acquired from UAV is not new. Himstedt et al. (2012) showed the possibility of using images acquired 80 cm above sward surface to estimate dry matter of clover and grass separately even though the crops were grown together in the field. The normalized green-red difference index (NGRDI) measured using a RGB camera mounted on a UAV has also been used to estimate biomass in a plot experiment of peas or oats Jannoura et al. (2015). Our aim is to develop an image processing approach for estimating the biomass of oil radish (Raphanus sativus L.) and winter wheat (Triticum aestivum L.). The proposed method uses images acquired from an RGB camera mounted on an unmanned aerial vehicle (UAV) flying at low altitude. The proposed method is evaluated on an orthophoto stitched together from all the captured images. Plant samples were taken and GPS coordinates noted at different locations in the field. The samples were dried where after the biomass (kg/ha) was measured. In the orthophoto, the species are separated using image processing. Thereafter, the biomass is estimated using a linear model. The measured biomass of the plant samples was used to train the linear model, which was then extrapolated to the entire field.

References:

Himstedt, M., Fricke, T. and Wachendorf, M. 2012. The Benefit of Color Information in Digital Image Analysis for the Estimation of Legume Contribution in Legume-Grass Mixtures. Crop Science, 52 943-950.

Jannoura, R., Brinkmann, K., Utea, D., Bruns, C. and Joergensen, R. G. 2015. Monitoring of Crop Biomass using True Colour Aerial Photographs taken from a Remote Controlled Hexacopter. Biosystems Engineering, 129, 341-351.

3rd Science for the Environment Conference
Aarhus Denmark 1-2 October 2015