

Grazed grass was estimated via satellite images better than mowed grass

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Precise livestock management requires objective alert system about the potential threats of overgrazing and intensive mowing. This kind of system could be based on the estimation of the amount of grazed and mowed biomass by remote sensing of vegetation indices. In our study we used the Normalized Difference Vegetation Index (NDVI) derived from Landsat 7 and 8 satellites to establish a regression between the vegetation index and the biomass (cut from ten, 40×40 cm plots, during 52 measurement campaigns, 2011-2013) in a semi-arid grassland of Hungary, Bugac. Based on the regression time series of NDVI data were converted into biomass data in case of grazed and mowed areas (2011-2016). Biomass changes, inferred from NDVI data, were compared to the estimated grazed (based on daily dry matter uptake of cattle) and measured mowed (weighted) biomass. We found significant correlation between the NDVI and the total biomass ($r^2=0.6$, $p<0.05$, $n=52$, $RMSE=52.8 \text{ g m}^{-2}$) and a stronger one between the NDVI and the green biomass ($r^2=0.75$, $p<0.05$, $n=52$, $RMSE=36.8 \text{ g m}^{-2}$). We found that the amount of grazed biomass based on dry matter uptake was in close agreement with the biomass changes inferred from NDVI data ($r^2=0.42$, $p=0.11$, $n=7$, $RMSE=25.2 \text{ g m}^{-2}$). However, there was no correlation between the biomass of the measured hay and the biomass inferred from NDVI data ($r^2=0.16$, $p=0.49$, $n=5$, $RMSE=67.4 \text{ g m}^{-2}$). This was most probably due to the fact that mowing is a sudden, while grazing is a prolonged event, hence satellite data are less likely to be available before and after the mowing events (i.e. within days) compared to the grazing periods which usually lasts for months (only 12 ± 2 satellite images were suitable per year). Therefore, NDVI changes are more accurately captured when grazing is observed than when mowing. We concluded that NDVI data from satellite images could be used to estimate the amount of grazed biomass, however to estimate the amount of mowed hay more frequent data coverage would be needed.