

Yield Assessment of a 270 000 Plant Perennial Ryegrass Field Trial using a Multispectral Aerial Imaging Platform

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Abstract:

Current assessment of non-destructive yield in forage breeding programs relies largely on the visual assessment by experts, who would categorize biomass to a discrete scale. Visual assessment of biomass yield has inherent pitfalls as it can generate bias between experimental repeats and between different experts. Visual assessment is also time-consuming and would be impractical on large scale field trials. A method has been established to allow for a rapid, non-destructive assessment of biomass yield of forages using aerial based multi-spectral imaging technologies. This method uses aerial surveillance platforms, including a 3DR Solo with Parrot Sequoia sensor and DJI S1000+ with a Tetracam MCA-12 sensor, to take weekly images of a field trial that consists of a global perennial ryegrass reference population of 270 000 individual plants from a 1300 varieties/breeding lines. Multispectral images are processed through Pix4D to create a georeferenced orthomosaic image with an average ground sampling distance (GSD) below 2cm. Plant vegetation indices are extracted as a point *.shp file for further processing in QGIS software. Plant indices are then calculated and processed for single plants, rows or plots based on user defined georeferenced areas in QGIS software allowing for the quantitative measurements of various vegetation indices. This screening technique will assist with the development of a genomic selection prediction equation for biomass in perennial ryegrass.



Figure 1. Aerial image of a section of the Example figure caption a global perennial ryegrass reference population of 270 000 individual plants from a 1300 varieties/breeding lines.