

Aerial Imagery Can Detect Nitrogen Fertilizer Effects on Biomass and Stand Health of *Miscanthus x giganteus*

Background/objective

Optimal nitrogen (N) fertilizer management is crucial for sustainable production of *Miscanthus x giganteus* (*Mxg*), a warm-season perennial grass grown for bioenergy feedstock production. While many studies have assessed the relationship between ground-measured phenotypic traits and biomass yield, reliance on subplot measurements may be inaccurate due to stand heterogeneity. To address this challenge, researchers tested the use of aerial imagery to evaluate biomass yield and stand health across an *Mxg* N-application gradient.

Approach

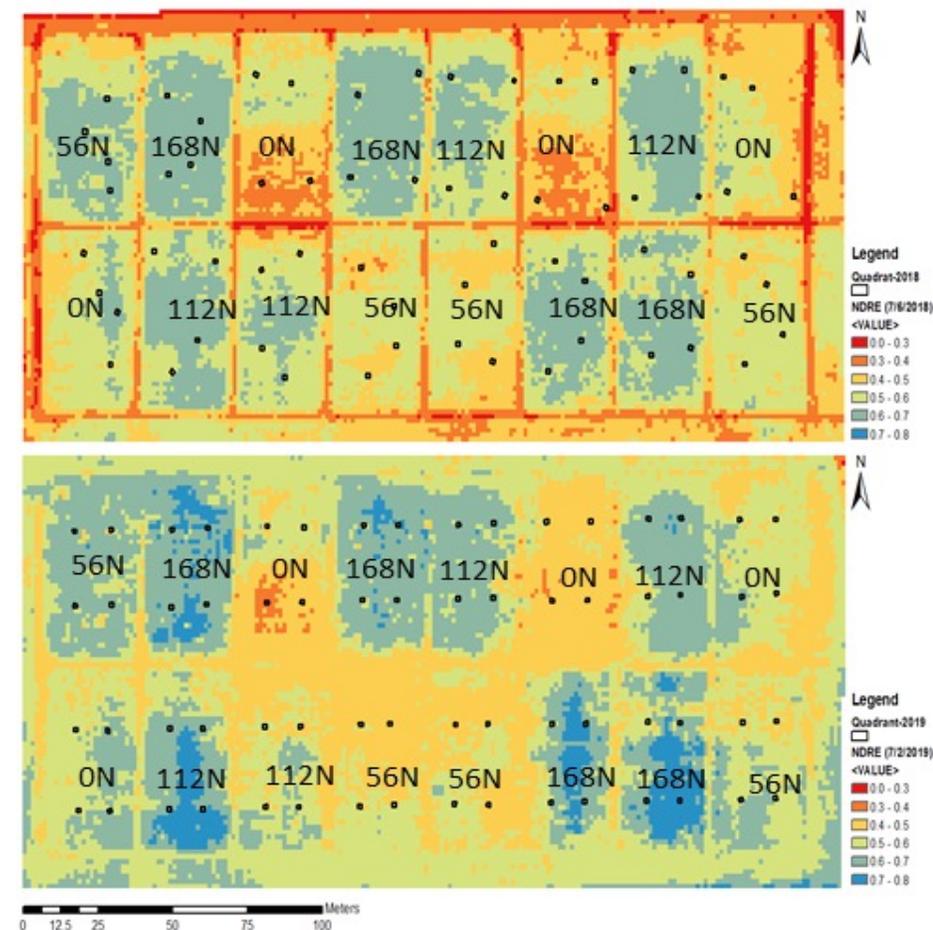
- ❖ Conducted flight campaigns to measure Vegetation Indices (VIs: NDVI, NDRE, GNDVI) in early-, mid-, and late-summer growing season in 2018 and 2019 over *Mxg* plots with four N-application rates (0, 56, 112, and 168 kg N/ha) located in Urbana, IL.
- ❖ Used quadrat surveys and combine harvester to measure fresh and dry biomass.

Results

- ❖ Midsummer NDRE was the VI which provided the best prediction of biomass and stand health.
- ❖ VI could be used to distinguish 0 and 168 kg N/ha treatments but not 0 and 56 kg N/ha or 112 and 168 kg N/ha.
- ❖ *Mxg* yield improved after 112 kg N/ha application.

Significance

Aerial VI measurement may be a cost-effective tool for rapidly estimating *Mxg* biomass and stand health. While further studies are needed, this work suggests that moderate (112 kg N/ha) N application may be most effective for preventing *Mxg* stand deterioration with time.



Aggregated 1m-resolution NDRE maps from early-season 2018 (top) and 2019 (bottom) show overall higher NDRE, indicative of better stand health, in plots with 112 or 168 kg N/ha treatments. Points show quadrat sample locations used for quadrat-level measurements.