FACULTY OF BIOSCIENCE ENGINEERING

NONDESTRUCTIVE OPTICAL CROP PHENOTYPING TO MONITOR NITROGEN CONTENT IN FIELD-GROWN ORNAMENTALS.

Bracke, J. (1, 2, 3), Adriaenssens, S. (4), Elsen, A. (3), Vandendriessche, H. (2, 3), Van Labeke, MC. (1);
(1) Ghent University, Department of Plants and Crops, Faculty of Bioscience Engineering, Ghent, Belgium, (2) KU Leuven, Department of Biosystems, Faculty of Bioscience Engineering, Leuven, Belgium, (3) Soil Service of Belgium, Leuven, Belgium, (4) PCS Ornamental Plant Research, Destelbergen, Belgium; (J.Bracke@UGent.be).

Nitrogen (N) nutrition

- Sub-optimal: plant quality ↘ (height, branching, leaf colour)
- Supra-optimal:
  - environmental impact (nitrate leaching) ↗
  - plant quality ↘

Challenge

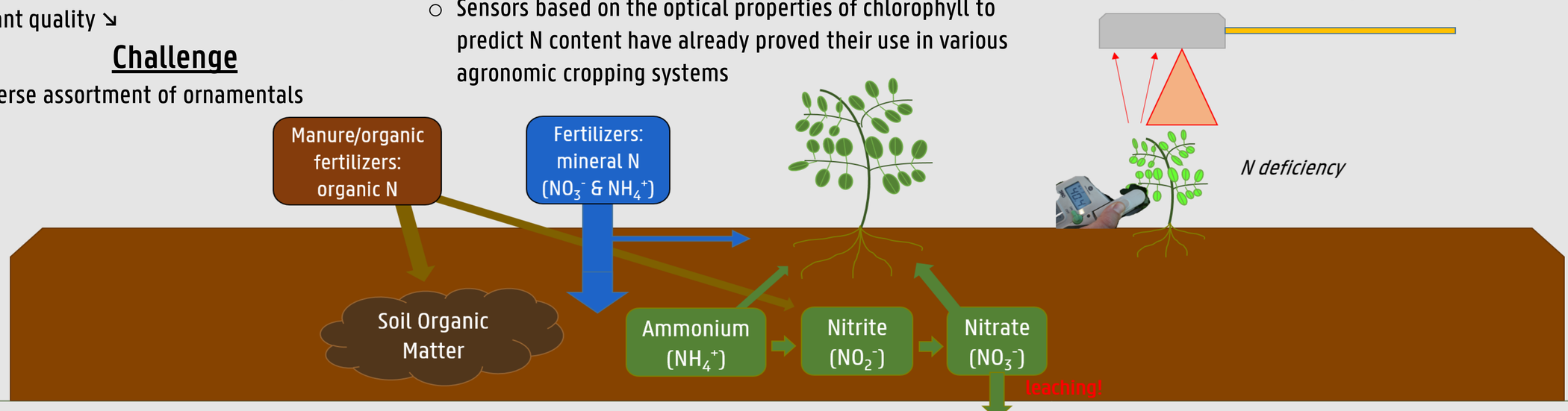
- Hyper diverse assortment of ornamentals

Today

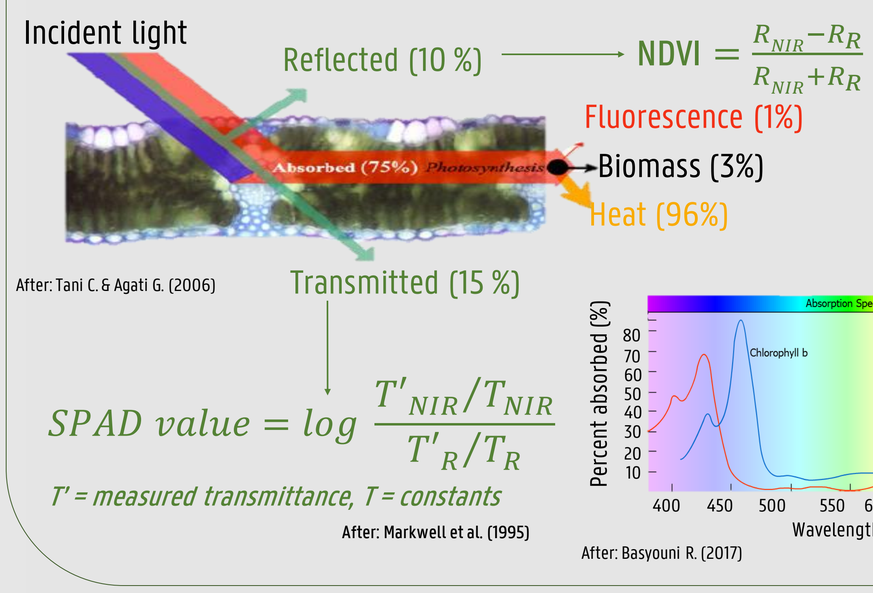
- Excessive application of N due to unknown N uptake levels: generally high levels of residual nitrogen in the sector
- Destructive leaf analysis: expensive + time consuming
- Sensors based on the optical properties of chlorophyll to predict N content have already proved their use in various agronomic cropping systems

Tomorrow?

- Monitor plant dry matter yield and N uptake to optimize N fertilization rate
- Use non-destructive crop sensors on ornamentals as easy & quick decision supporting phenotyping tools



Background: chlorophyll is a predictor for N %

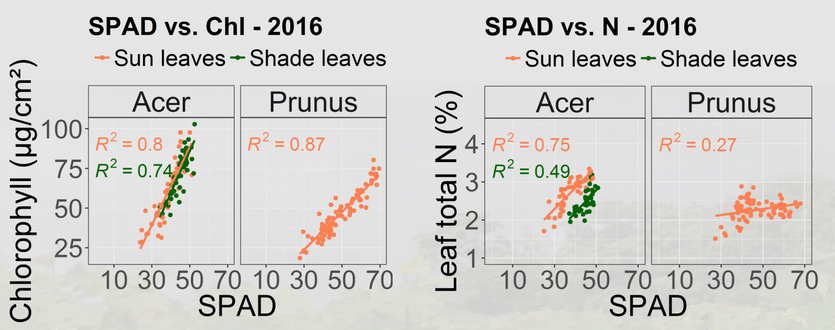


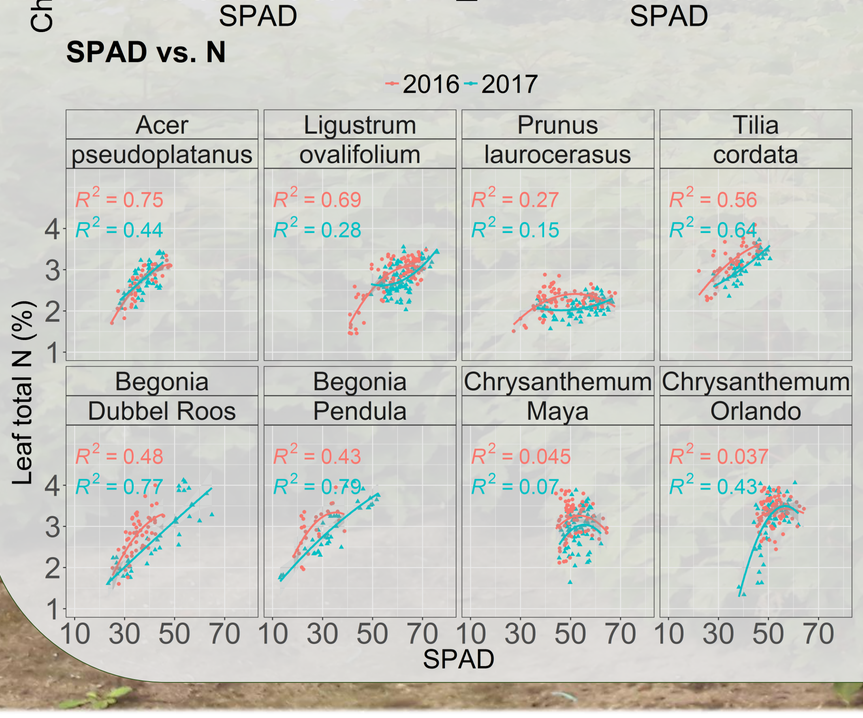
Materials & methods

- 6 species: *Acer pseudoplatanus*, *Ligustrum ovalifolium*, *Prunus laurocerasus* 'Rotundifolia' , *Tilia cordata, Chrysanthemum morifolium* ('Maya' & 'Orlando') *& Begonia x tuberhybrida* ('Pendula' & 'Double Rose')
- 3 different N treatments in 3 replicates (zero, advise and double dosage; after soil analysis)
- 2 sensors for non-destructive measurements:
  - Leaf level: SPAD-502 (Minolta) - chlorophyll meter
  - Canopy level: GreenSeeker RT100 (Trimble) – NDVI meter
- During growing season:
  - Growth, biomass and N concentration measurements
  - Non-destructive N measurements with SPAD & GS
  - Destructive chlorophyll analysis for *Acer* & *Prunus* in 2016

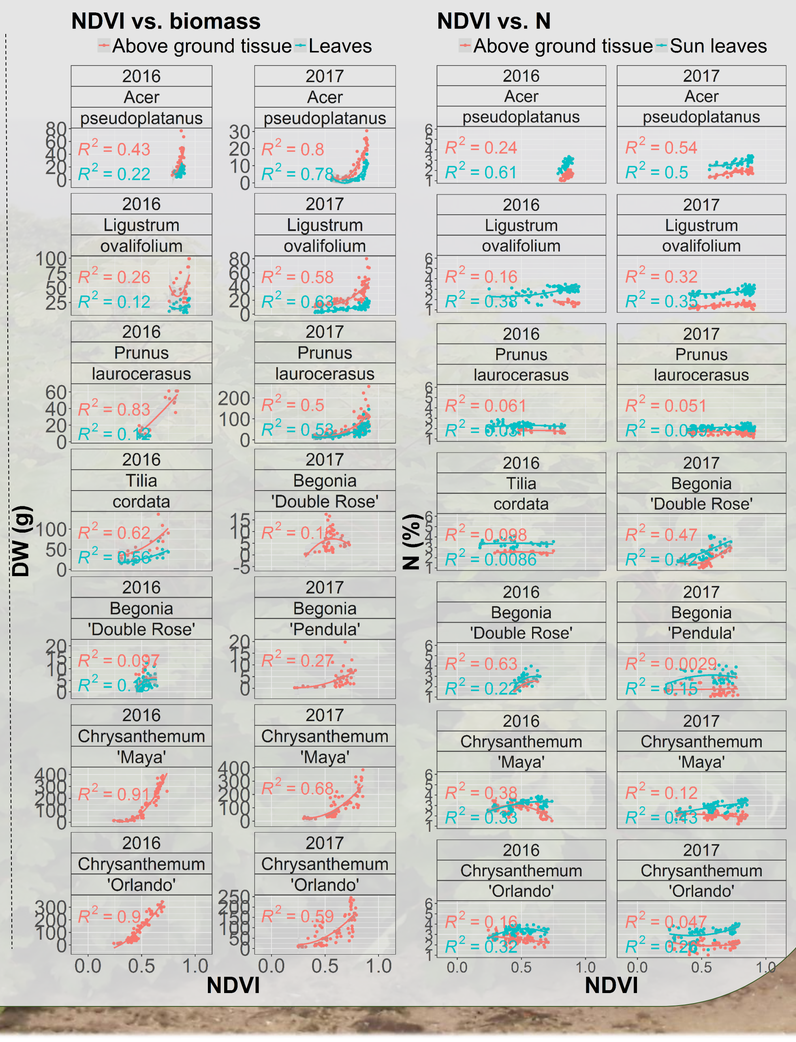
Results

Leaf level





Canopy level



Conclusions

1. Correlation between SPAD & N is species- & leaf type (sun/shade) dependent.
2. SPAD is a good predictor for chlorophyll for *Acer* , *Prunus*, but fails for predicting foliar N% for *Prunus* (leaf structure, wax layer). The correlation between SPAD & N is also good for *Ligustrum* , *Tilia*. & *Begonia*. The SPAD meter was demonstrated to be a potential useful device for non-destructively assessing foliar N status for 4 out of 6 of the tested ornamental species.
3. GreenSeeker readings (NDVI) do correlate well with aboveground biomass for most species except *Begonia*. Generally, correlations does not improve when taking only leaf biomass into account.
4. GreenSeeker readings (NDVI) show limited potential to predict N% in different plant tissues of all 6 tested ornamentals. For some species, NDVI correlates better with foliar N (sun leaves only).

GHENT UNIVERSITY · KU LEUVEN · Soil Service of Belgium · PCS · FLANDERS INNOVATION & ENTREPRENEURSHIP · Flanders State of the Art