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4th Workshop
Fertilisation and Irrigation

Development of a protocol for the management of nitrogen fertilization in rocket

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PON RICERCA E INNOVAZIONE

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Introduction

- Rocket is a typical product in the "Piana del Sele", Campania region, Italy; Protected Geographical Indications (PGI) from November 2020; accounts for 80% of the national production
- High level of automation for harvesting, cultivation in PE multi-tunnel
- Very intensive monocropping system
- Constant addition of organic manure and high inputs of nitrogen; NO_3 leaching
- Unpredictable nitrate accumulation in edible organs may limit commercial yield
- POFACS project: national project on post-harvest, marketing and quality in the horticultural chain (vegetable and fruits)

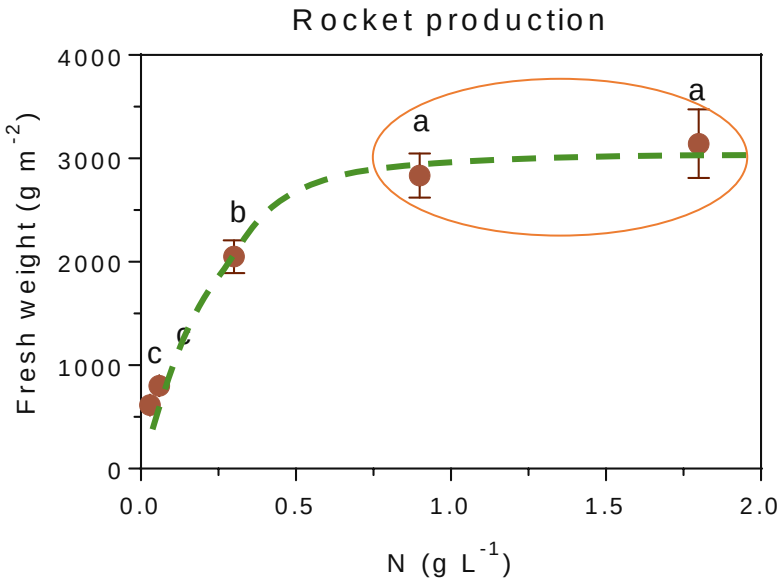
Management with different precision levels and complexity

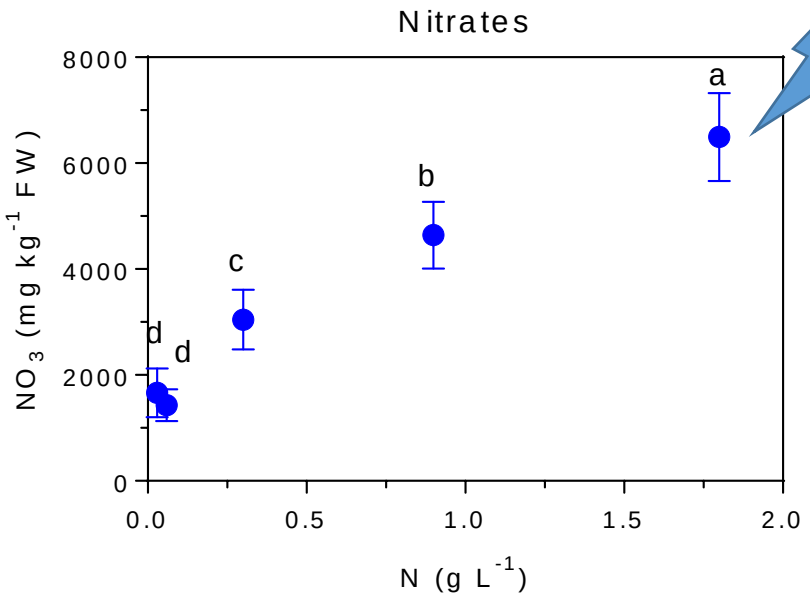
- **Level 1:** evaluation of the nutrient status of the root zone with soil:water extract 1:2 v/v trough the individuation of specific thresholds in the "GreenFert" DSS (Incrocci et al. 2013)
- **Level 2:** prediction of N uptake basing on simulated plant growth for N supply during the cultivation
- **Level 3:** canopy monitoring through optical sensors for corrective actions and warning alert system for high nitrate content in plant tissue at harvest

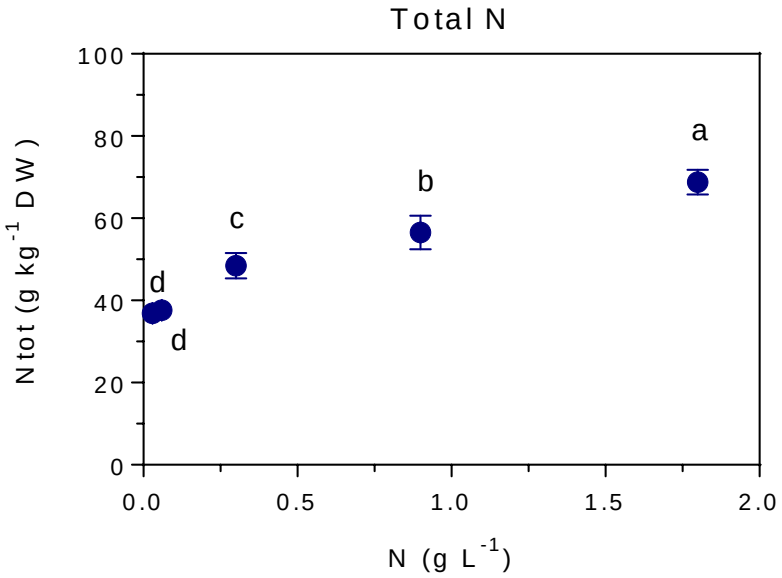
Experiments in 2021-2022

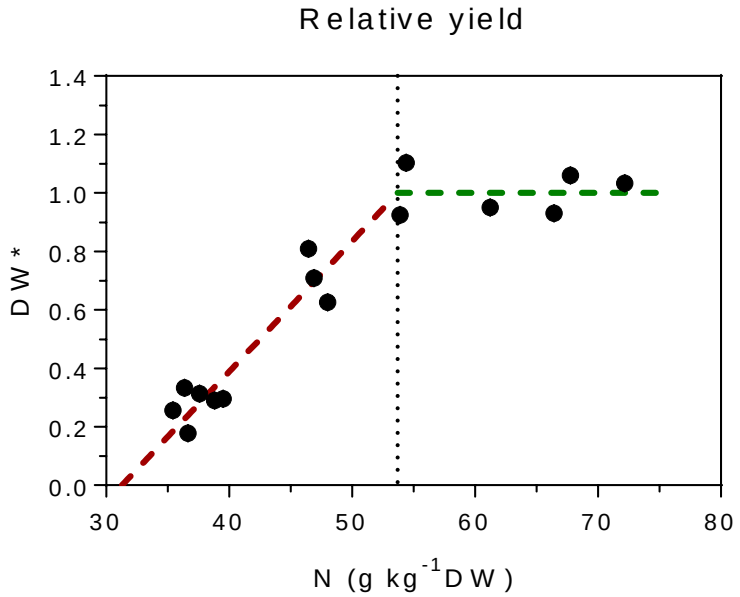
- Greenhouse bench experiment in an experimental greenhouse: model and sensor calibration
  - N 0.03 – 1.8 g per L of substrate
  - controlled release fertilizer (38% N) + nutrient solution for other elements
  - 4 cuttings, 175 days (sowing date 03 November 2021)
  - samples collected in triplicates: LAI, plant biomass, N tissue concentration, leaf pigments
- Greenhouse soil experiment under commercial conditions: GreenFert calibration and model validation
  - optimal N nutrition and other agricultural practices
  - sandy-loam soil tilled as in the standard practices
  - 3 cuttings, 145 days (sowing date 20 October 2021)
  - samples collected in triplicates: LAI, plant biomass, N tissue concentration, N soil concentration

Bench experiment: main results

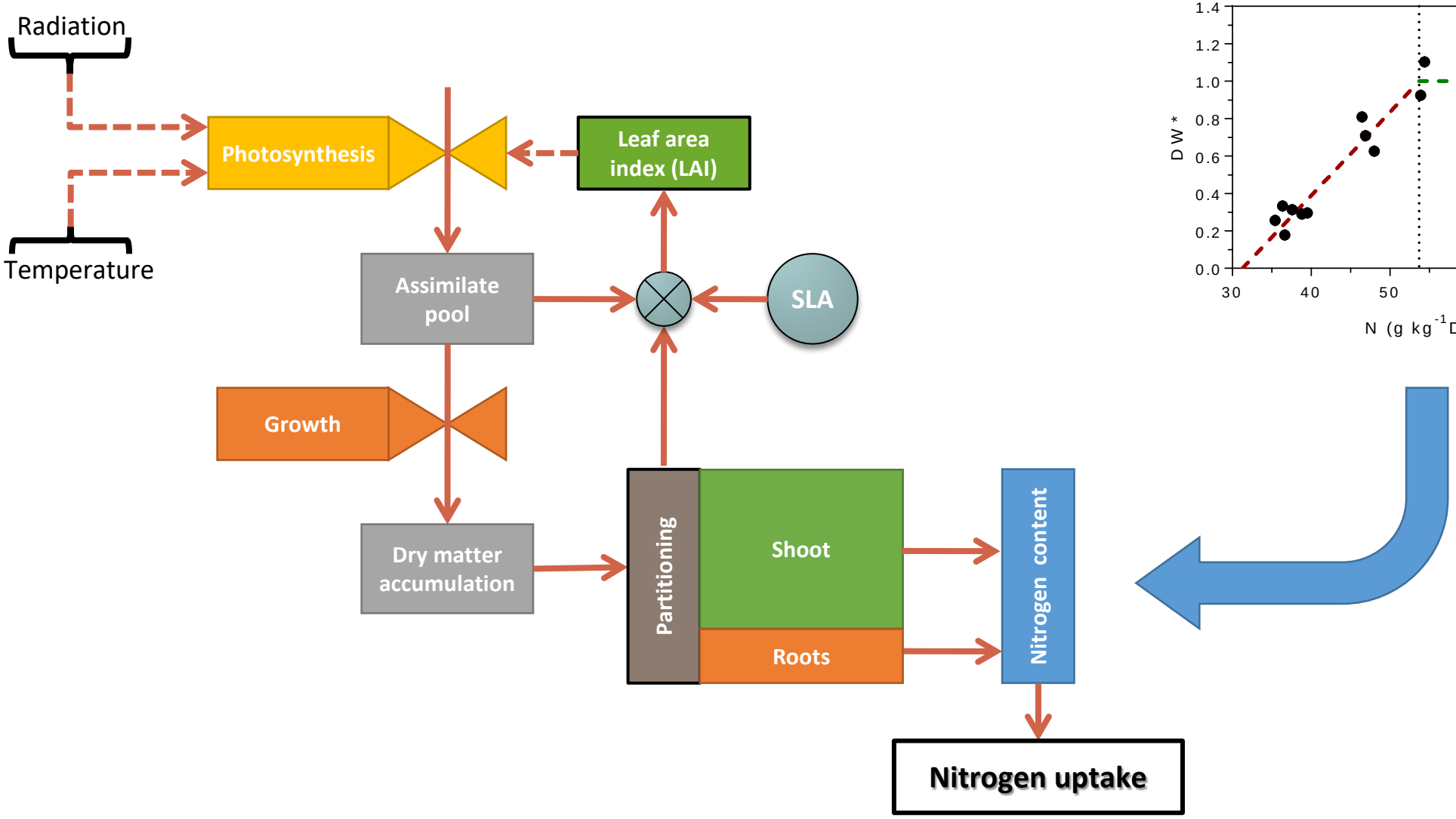




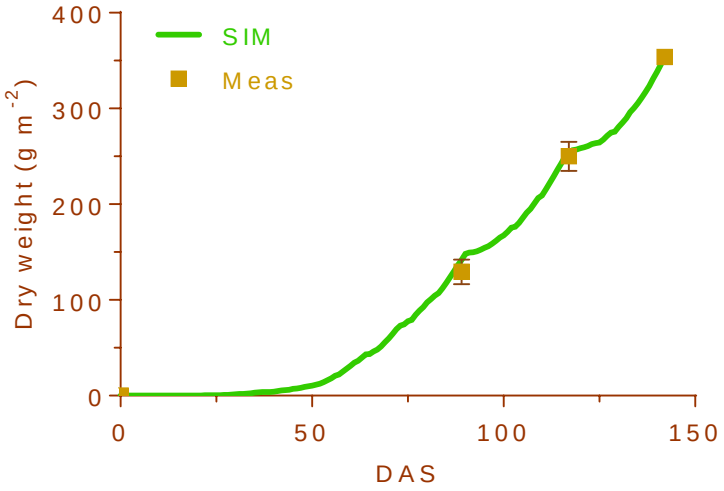


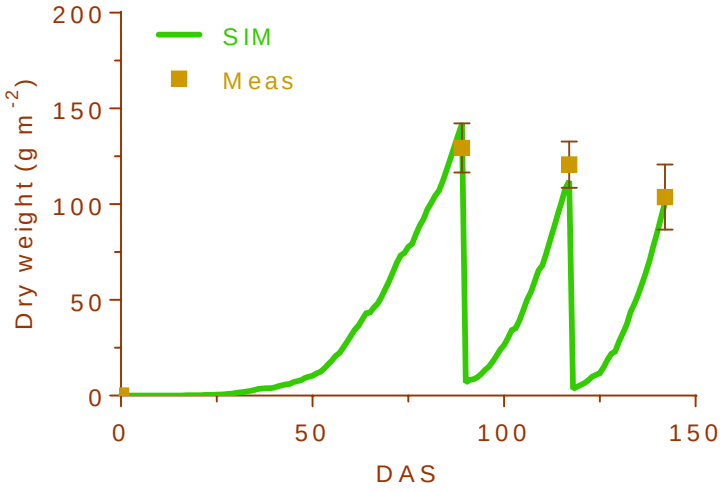


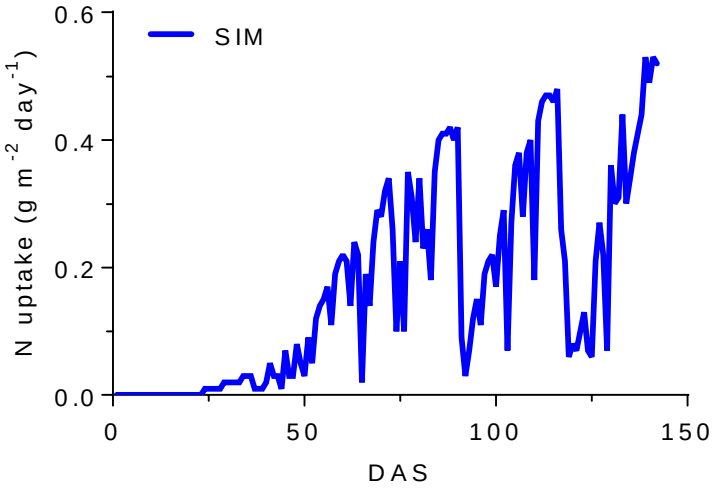
Level 2: prediction model calibration in the experimental greenhouse

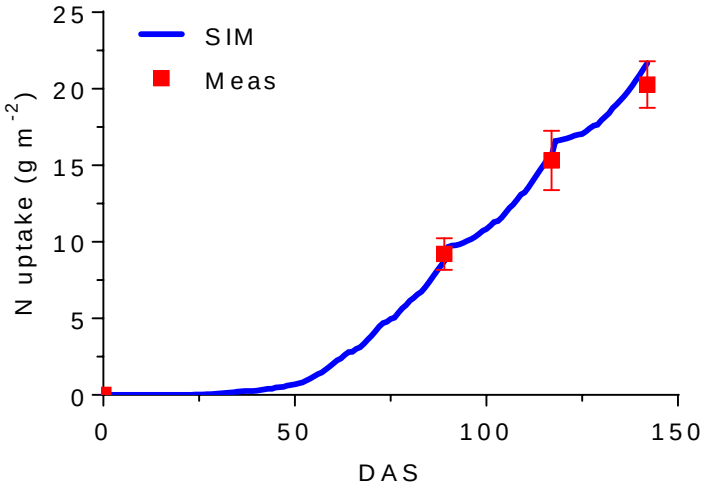


Level 2: prediction model validation in the commercial greenhouse

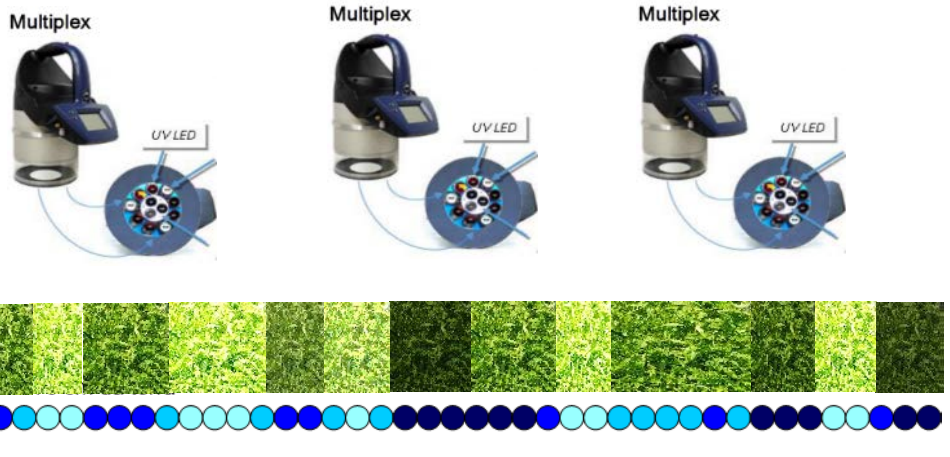


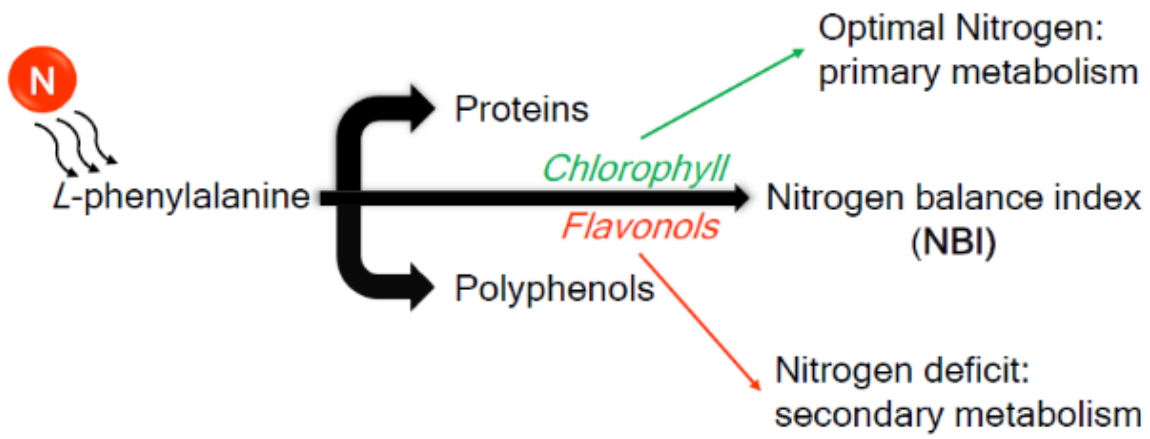


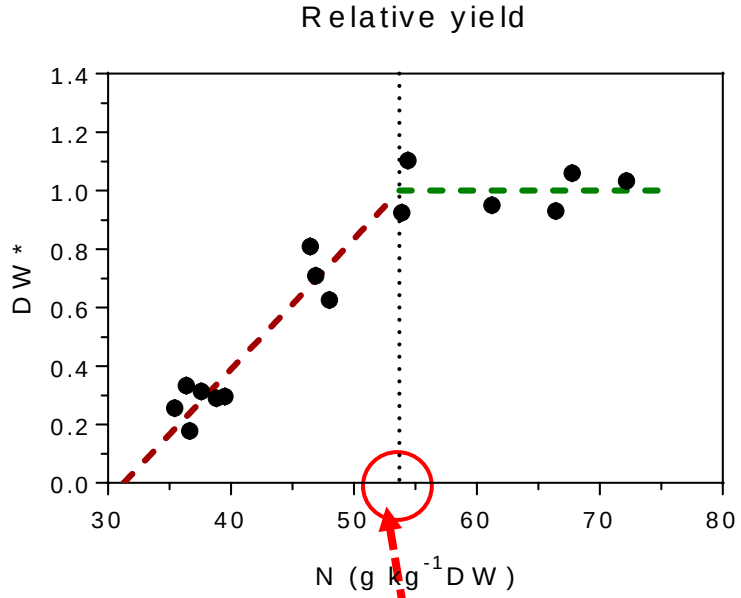


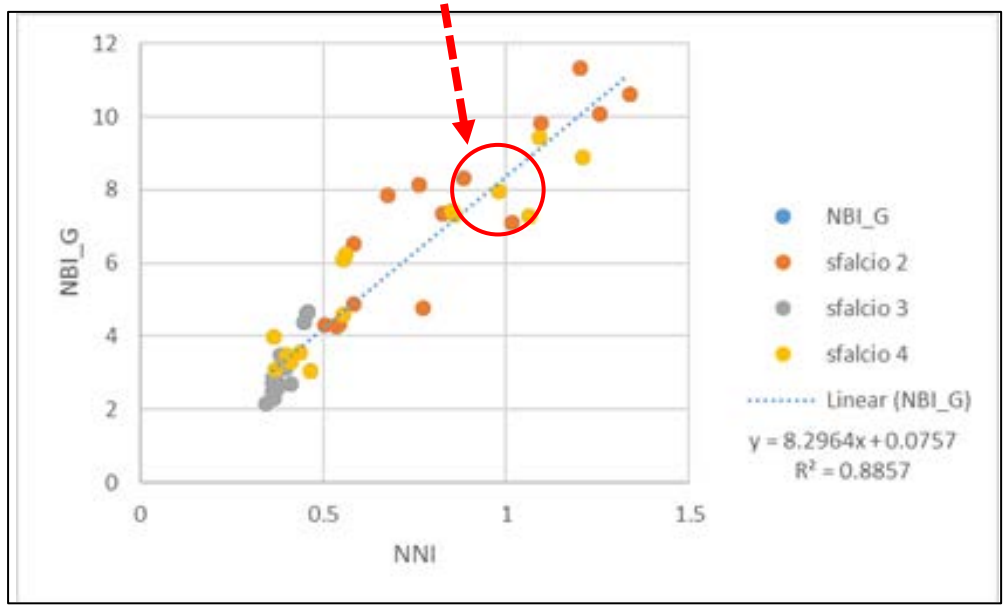


Level 3: canopy monitoring









Summing-up of main results and future activity

- The first experiments allowed the calibration and validation of a simulation model to predict N uptake
- The fluorescence sensor showed high capability in monitoring N status of rocket
- Other experiments are required to assess N supply based on model simulations that take into accounts N release from organic manure and matter in general in the root zone
- Next step with the sensor is to establish relationships between measurements and NO_3 tissue concentration
- Limit thresholds and optimal values in the soil:water extract have to be defined

Thanks …for your attention

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