



HAL
open science

On-farm experimentation with low-tech sensors for monitoring and managing cover crops in viticulture

Anice Cheraïet, Léo Garcia, Alexis Bourguignon, Marie Gosme, Véronique Bellon-Maurel

► **To cite this version:**

Anice Cheraïet, Léo Garcia, Alexis Bourguignon, Marie Gosme, Véronique Bellon-Maurel. On-farm experimentation with low-tech sensors for monitoring and managing cover crops in viticulture. Converge of research in Digital Agriculture Leading Labs, Apr 2026, Montpellier, France. <hal-05604072>

HAL Id: hal-05604072

<https://hal.inrae.fr/hal-05604072v1>

Submitted on 27 Apr 2026

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY-NC-SA 4.0 - Attribution - Non-commercial use - ShareAlike - International License

On-farm experimentation with low-tech sensors for monitoring and managing cover crops in viticulture

Léo Garcia², Anice Cheraiet¹, Alexis Bourguignon¹, Marie Gosme²,
Véronique Bellon-Maurel¹

¹ ITAP, Univ. Montpellier, INRAE, Institut Agro, Montpellier, France

² ABSys, Univ. Montpellier, CIRAD, INRAE, Institut Agro, Montpellier, France

Léo Garcia (leo.garcia@institut-agro.fr)

Introduction

- The development of low-cost sensors for measuring agroecological indicators offers new prospects for accessible monitoring of agricultural practices
- In viticulture, the evaluation of cover crop biomass is a major challenge for the management of ecosystem services
- We tested the ability of a low-cost sensor (Vegemeter), to return measurements comparable to those of a high-tech sensor (Greenseeker™) and to predict cover crops biomass



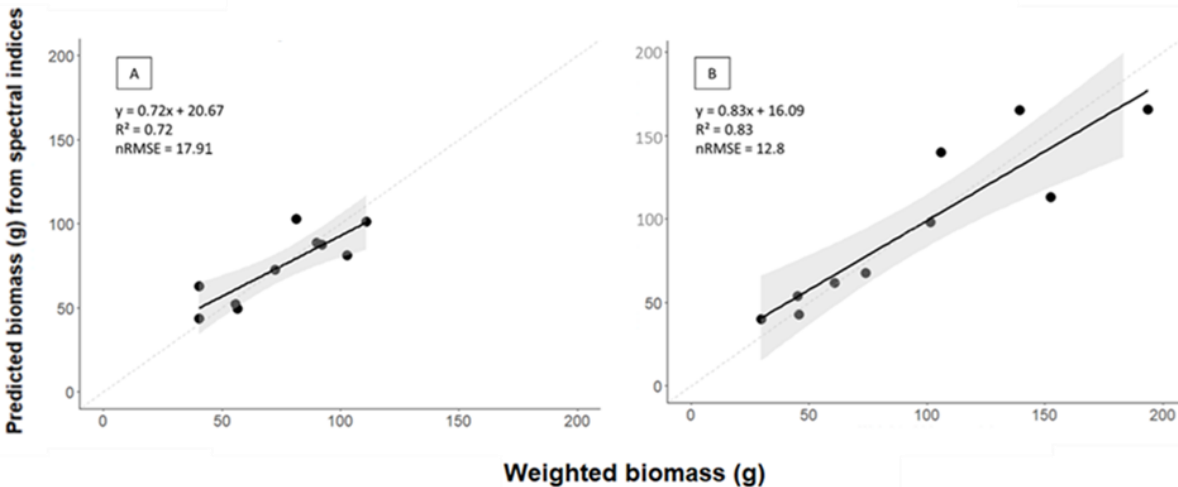
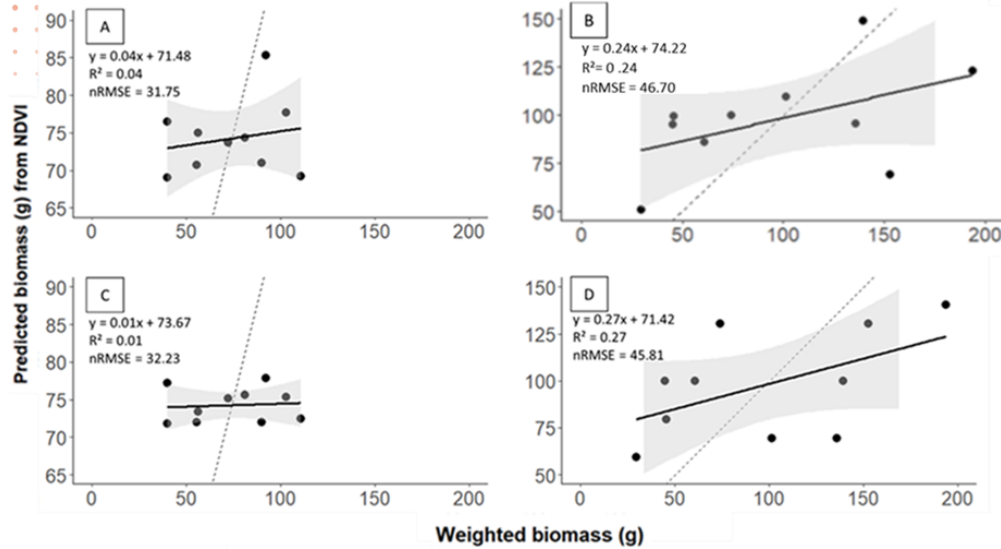
Material and methods



- The vegemeter: a low-cost multispectral device
 - 18 spectral bands between 410 and 940 nm
 - Measures canopy reflectance (passive measurement), computes NDVI in real time, records the full spectral signal for post-processing
 - 3D printed housing
- Field trial
 - Three cover crop modalities: spontaneous vegetation, sown multi-species cover crops, faba bean
 - Greenseeker™ + Vegemeter data acquisition on 20 plots
 - Destructive biomass measurement on the same 20 plots
- Data analysis
 - Calculation of NDVI + other vegetation indexes (red-edge chlorophyll index (CI), green band CI, Modified Simple Ratio (MSR))
 - Biomass prediction with NDVI and multivariate linear regression using Vegemeter indexes

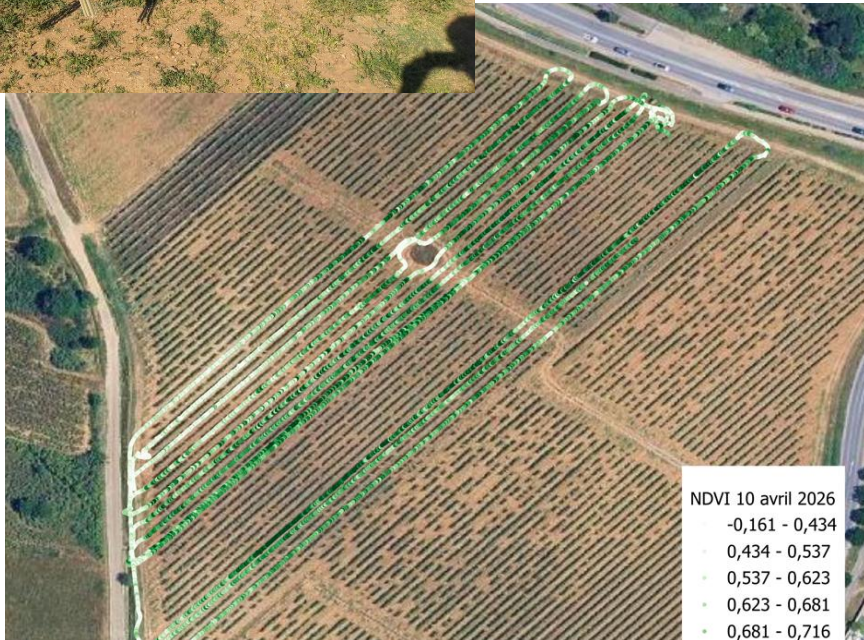


Results



- Vegemeter and Greenseeker NDVI values are strongly correlated ($R^2 = 0.85$)
- **NDVI** alone showed **limited biomass prediction** accuracy, with performance varying by grass cover type
- **Alternative spectral indices** significantly improved biomass prediction
 - For sown species, CI_{green} and $CI_{rededge}$ provided excellent results ($R^2 = 0,83$)
 - For spontaneous vegetation, the addition of MSR improved model performance ($R^2 = 0,72$).

Perspectives



- **Data acquisition** in **various agronomical situations**: cash crops, intercropping, understory vegetation strip in agroforestry systems...
- Assess overall Vegemeter performances, models robustness
- Deployment of **biomass measurements at large scale**: onboard sensor and mapping



Thanks for your attention

Contact :

anice.cheraiet@inrae.fr

marie.gosme@inrae.fr

leo.garcia@institut-agro.fr

veronique.bellon-maurel@inrae.fr

