



carlos.campillo@juntaex.es

# Image-based production prediction analysis and monitoring of processing tomato vegetative development

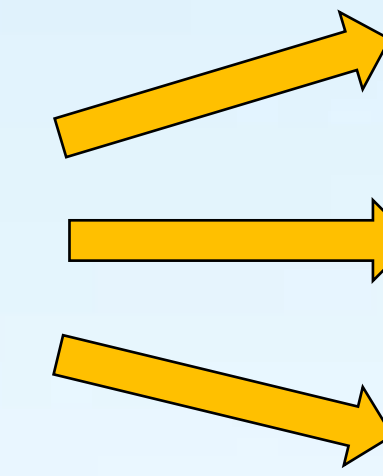
J.M. Vadillo<sup>1</sup>, V. Cerasola<sup>2</sup>, V. Gonzalez<sup>1</sup>, M.H. Prieto<sup>1</sup>, C. Campillo<sup>1</sup>

<sup>(1)</sup> Centro de Investigaciones Científicas y Tecnológicas de Extremadura (CICYTEX), Finca La Orden, Junta de Extremadura, Autovía A-V, Km 372, 06187, Guadajira, Spain  
<sup>(2)</sup> Department of Agricultural and Food Science and Technologies (DISTAL), Alma Mater Studiorum University of Bologna, Viale Fanin 44, 40127 Bologna, Italy

## Introduction

The aim is to be able to monitor the development of the industrial tomato crop by means of drone flights or satellite images.

Analyse different index by drone flight to know vegetative development



NDVI

NDRE

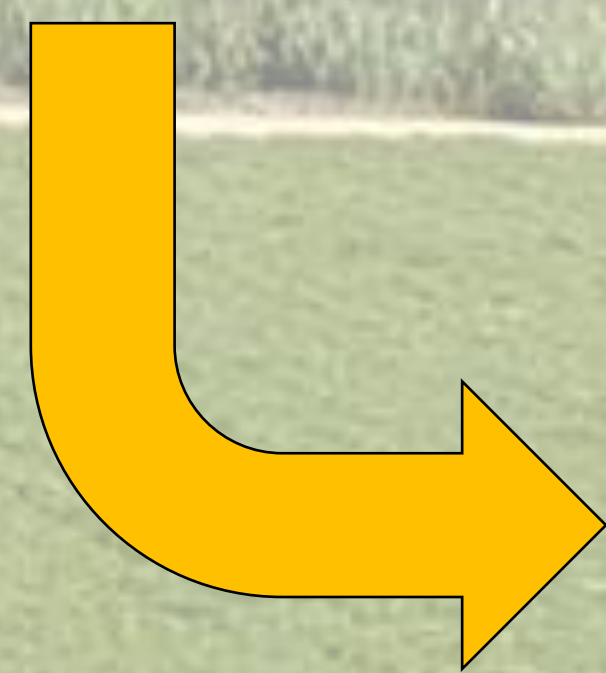
GNDVI

## Material and Methods

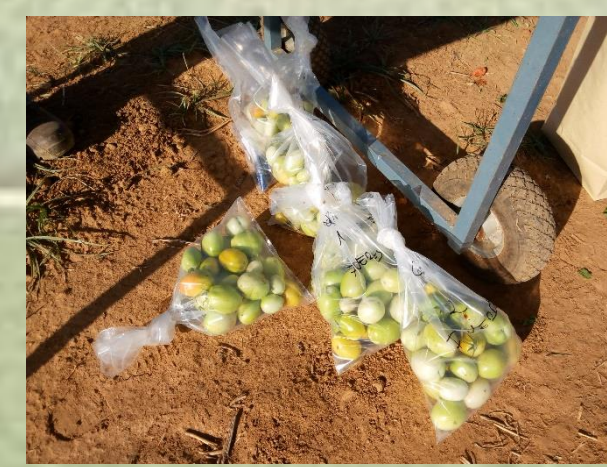
- Extremadura, Spain. (38° 51' 2.534", -6° 40' 14.735")
  - Randomized blocks with 4 replications
  - 108 m<sup>2</sup> surface per experimental unit
  - Beds 150 cm wide
  - Plant density: 20.000 plants/ha
- 4 treatments of N:
- N0: Null
  - N1: Deficient (-50% N2)
  - N2: Traditional
  - N3: Exceding (+50% N2)



### Sampling biomass



Following Greenwood et al., 1990



### Drone flight twice a month



DJI mini 3

### Mosaic of images



## Results

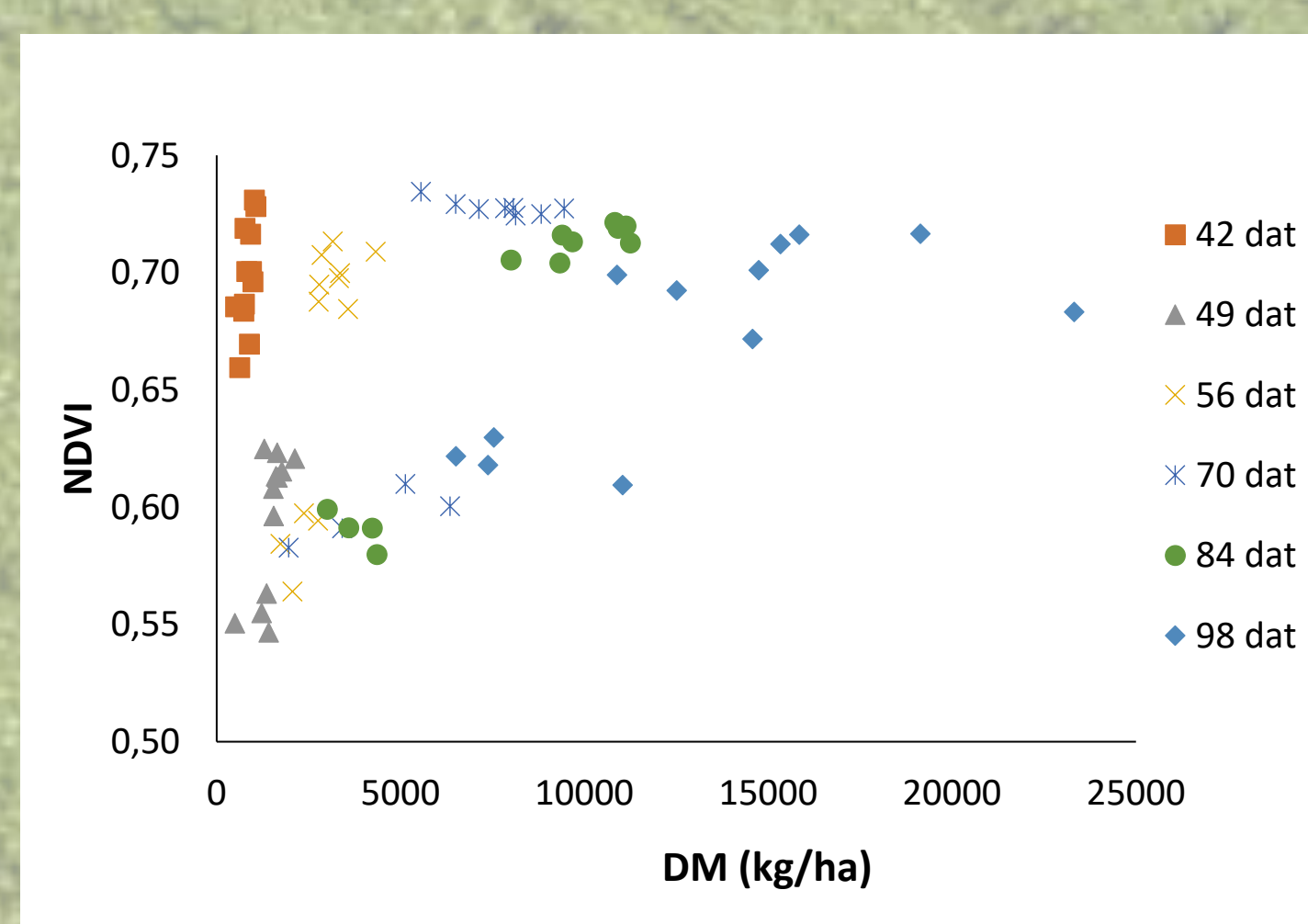


Figure 1: Relationship between NDVI and dry matter (DM) production along the crop cycle

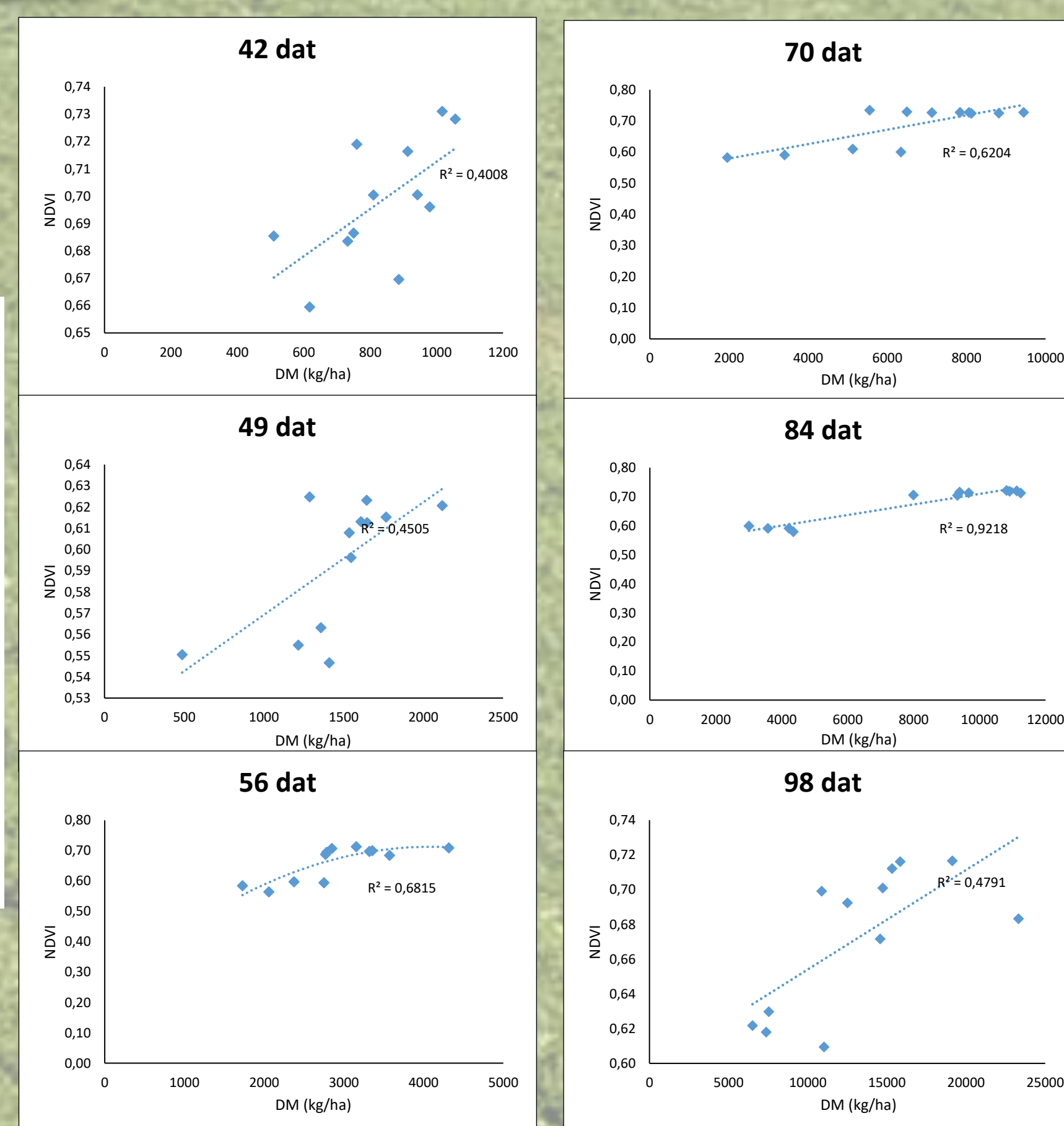


Figure 2: Relationship between NDVI and dry matter (DM) production along the crop cycle

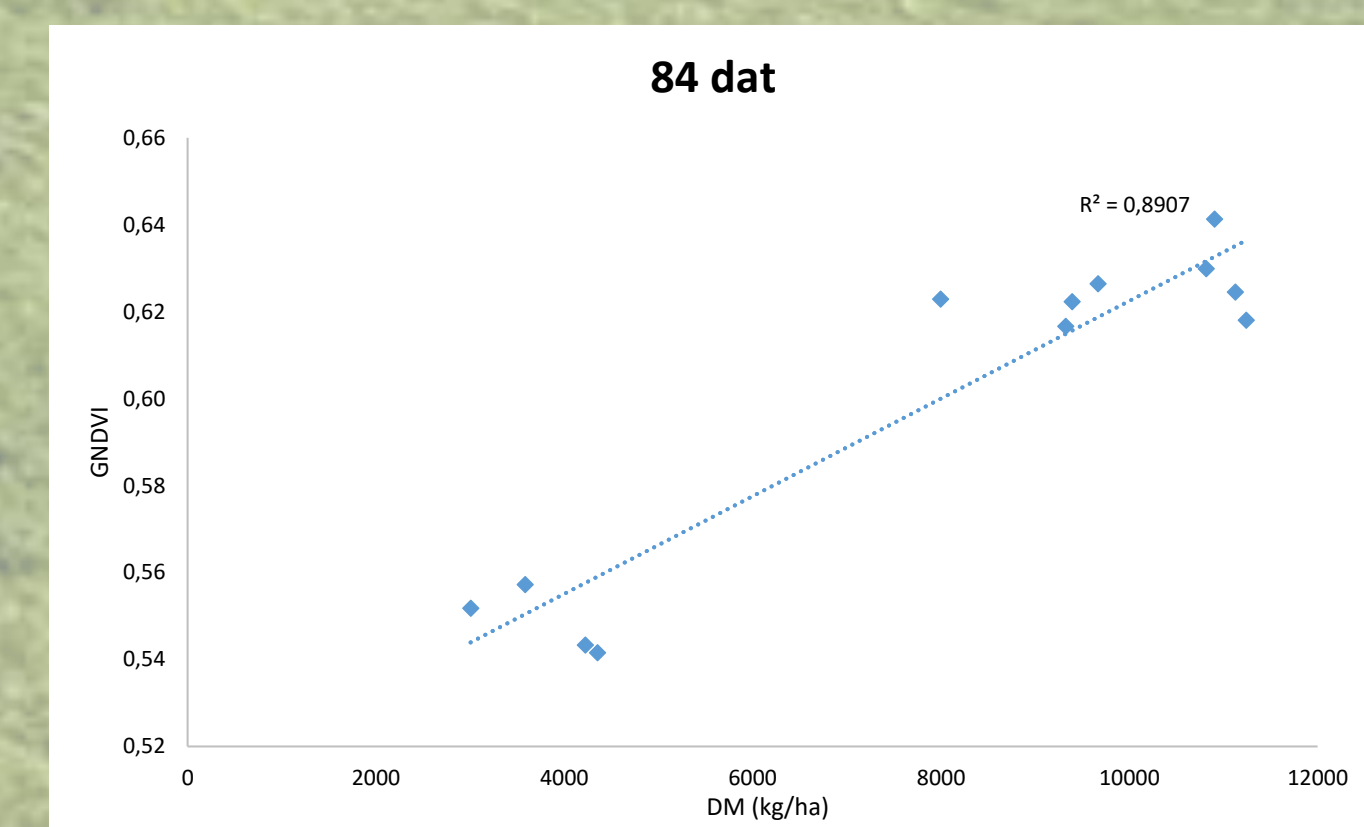


Figure 3: Relationship between GNDVI and dry matter (DM) production in 84 dat

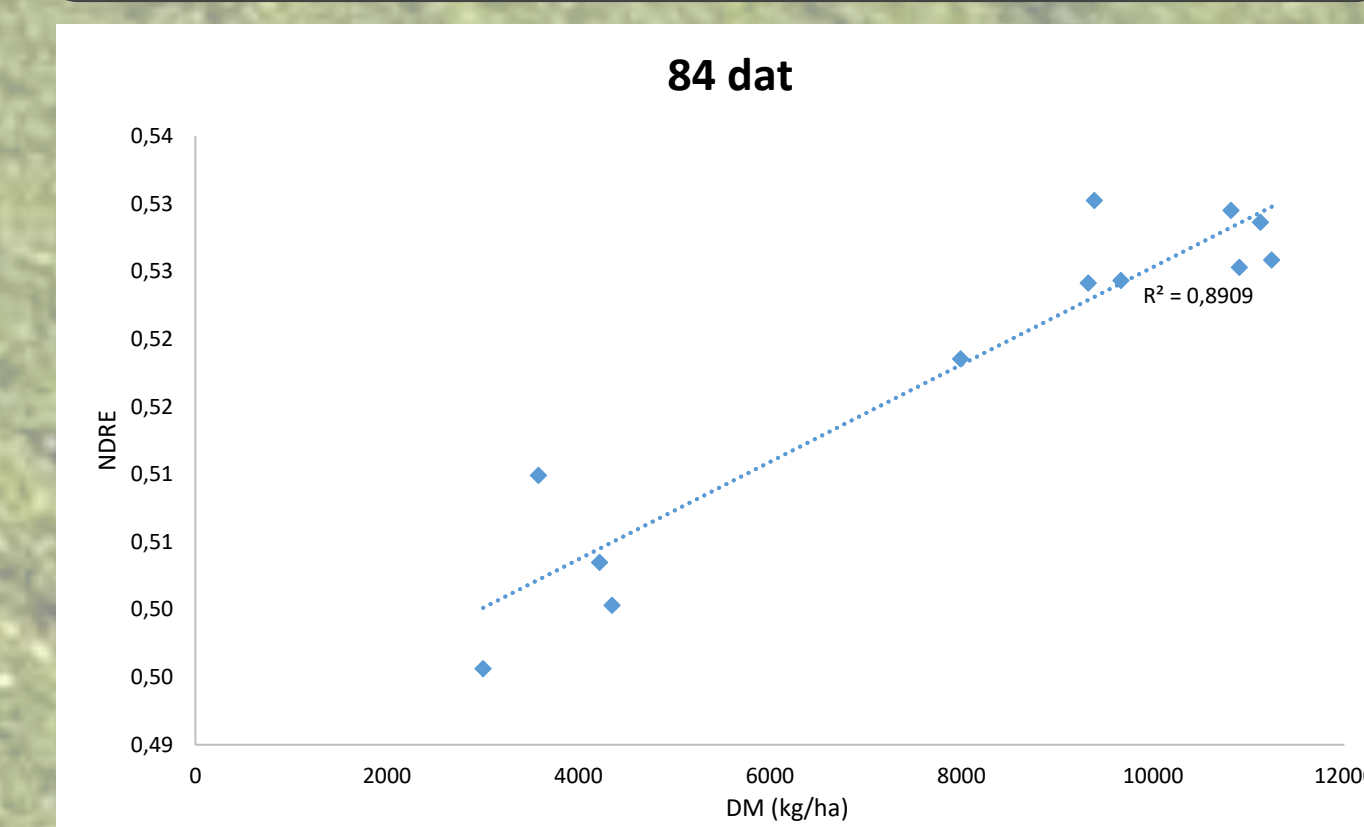


Figure 4: Relationship between NDRE and dry matter (DM) production in 84 dat

## Conclusions

- The methodology followed is a successful option to obtain the dry matter generated by the crop in real time and in a non-destructive way.
- Best date to correlate different index with dry matter is around 84 dat.
- In this study NDVI is the best index ahead of NDRE and GNDVI.

## References

- Greenwood, D. J., Lemaire, G., Gosse, G., Cruz, P., Draycott, A., & Neeteson, J. J. (1990). Decline in percentage N of C3 and C4 crops with increasing plant mass. . 425-436. <https://www.webofscience.com/wos/alldb/summary/308e6113-3bca-4957-9186-d2bc621af80d-045b418a/date-descending/1>
- Yuzhu, H., Xiaomei, W., & Shuyao, S. (2011). Nitrogen determination in pepper (*Capsicum frutescens* L.) plants by color image analysis (RGB). *African Journal of Biotechnology*, 10(77), 17737-17741. <https://doi.org/10.5897/AJB11.1974>

## Acknowledgements

This research is part of the DIGISPAC project (TED2021-131237B-C22) which has received a financial contribution from the programme Convocatoria 2021 - "Proyectos de Transición Ecológica y Transición Digital" and VEGSYSTUP (PDC 2022-133936-100) proof of concept.