



Precision agriculture '19



Wageningen Academic
Publishers

edited by:
John V. Stafford

Precision agriculture '19

edited by:
John V. Stafford

Papers presented at the 12th European Conference on Precision Agriculture
Montpellier, France
8-11 July 2019



**Wageningen Academic
Publishers**

Precision agriculture

Edited by
John V. Stafford

1st Edition
2019
112 pages

EAN: 9789086863372
e-EAN: 9789086868889
ISBN: 978-90-8686-337-2
e-ISBN: 978-90-8686-888-9
DOI: 10.3920/978-90-8686-888-9

**Photo cover: View of the vineyards of
Maguelone Island - Hérault, Languedoc**
© Photothèque Hérault Tourisme -
C. Gauthier

First published, 2019
© Wageningen Academic Publishers
The Netherlands, 2019

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned. Nothing from this publication may be translated, reproduced, stored in a computerised system or published in any form or in any manner, including electronic, mechanical, reprographic or photographic, without prior written permission from the publisher:
Wageningen Academic Publishers
P.O. Box 220
6700 AE Wageningen
The Netherlands

www.WageningenAcademic.com
copyright@WageningenAcademic.com

The individual contributions in this publication and any liabilities arising from them remain the responsibility of the authors.

The publisher is not responsible for possible damages, which could be a result of content derived from this publication.

Table of contents

Foreword <i>Prof. Bruno Tisseyre, Conference Chair</i>	5
Section 1 – Precision agriculture	21
Optimizing durum wheat cultivation in Northern Italy: assessing proximal and remote sensing derived from different platforms for variable-rate application of nitrogen <i>M.A. Bruce, J. Moretto, R. Polese and F. Morari</i>	23
Integrating geospatial tools and a crop simulation model to understand spatial and temporal variability of cereals in Scotland <i>D. Cammarano, J. Holland, B. Basso, F. Fontana, T. Murgia, C. Lange, J. Taylor and D. Ronga</i>	29
Comparing satellite and high-resolution visible and thermal aerial imaging of field crops for precision irrigation management and plant biomass forecast <i>A. Chen, V. Orlov-Levin, O. Elharar and M. Meron</i>	37
Identifying yield stability and drivers of yield variability in cotton using multi-layered, whole-farm datasets <i>P. Filippi, T.F.A. Bishop and B.M. Whelan</i>	45
Precision spraying by combining a variable rate application map with an on/off map <i>R. Hørfarter, M.D. Thorsted, K. Stougård and H.V. Poulsen</i>	53
Understanding intra-field variation in N requirement for oilseed rape <i>S.L. Kendall, K. Storer, R. Wade and P.M. Berry</i>	61
Evaluation of a functional Bayesian method to analyse time series data in precision viticulture <i>C. Laurent, M. Baragatti, J. Taylor, T. Scholasch, A. Metay and B. Tisseyre</i>	67
Production gap analysis – an operational approach to yield gap analysis using historical high-resolution yield data sets <i>C. Leroux, J. Taylor and B. Tisseyre</i>	75
Agriculture and digital sustainability: a Digitization Footprint <i>F. Marinello, R.G.V. Bramley, Y. Cohen, S. Fountas, H. Guo, M. Karkee, J.A. Martínez-Casasnovas, D.S. Paraforos, L. Sartori, C.G. Sørensen, B. Stenberg, K. Sudduth, B. Tisseyre, G. Vellidis and S.G. Vougioukas</i>	83
Using the WOFOST crop growth model to assess within-field yield variability <i>A.C. Tagarakis, G. Mimić, H.M. Vaessen, F. Rodriguez-Moreno, F.K. van Evert and V. Ćirić</i>	91
Empowering farmers by resolving the trust and legal issues emerging from precision farming <i>L. Wiseman and J. Sanderson</i>	99

Section 2 – Precision horticulture	107
3D point clouds from UAV imagery for precise plant protection in fruit orchards <i>M. Hobart, M. Schirrmann and M. Pflanz</i>	109
Calculating the water deficit spatially using LiDAR laser scanner in an apple orchard <i>N. Tsoulas, D.S. Paraforos, S. Fountas and M. Zude-Sasse</i>	115
Section 3 – Precision viticulture	123
Comparison of water potential and yield parameters under uniform and variable rate drip irrigation in a cabernet sauvignon vineyard <i>I. Bahat, Y. Netzer, A. Ben-Gal, J.M. Grünzweig, A. Peeters and Y. Cohen</i>	125
Use of an integrated model of water consumption as a decision support system for scheduling regulated deficit irrigation in a vineyard <i>J. Bellvert, M. Mata, X. Vallverdú, C. Paris and J. Marsal</i>	133
Deep learning for in-field image-based grapevine downy mildew identification <i>J. Boulent, M. Beaulieu, P.-L. St-Charles, J. Théau and S. Foucher</i>	141
Monitoring site-specific spraying in vineyards from a prescription map obtained with a UAV <i>J. Campos, M. Gallart, J. Llop and E. Gil</i>	149
Investigation on LiDAR-based indicators for predicting agrochemical deposition within a vine field <i>A. Cheraïet, M. Carra, A. Lienard, S. Codis, A. Vergès, X. Delpuech and O. Naud</i>	157
Missing plant detection and biomass estimation from 3D models generated from UAV in a vineyard <i>A. Matese, P. Cinat, Y. Romboli, A. Berton and S.F. Di Gennaro</i>	165
Combining target sampling with route-optimization to optimise yield estimation in viticulture <i>B. Oger, P. Vismara and B. Tisseyre</i>	173
Assessment of grapevine yield and quality using a canopy spectral index in white grape variety <i>M. Sozzi, A. Kayad, D. Tomasi, L. Lovat, F. Marinello and L. Sartori</i>	181
Assessment of vineyard trimming and leaf removal using UAV photogrammetry <i>J. Torres-Sánchez, D. Marín, A.I. De Castro, I. Oria, F.M. Jiménez-Brenes, C. Miranda, L.G. Santesteban and F. López-Granados</i>	187
Section 4 – Precision crop protection	193
On-board colour imaging for the detection of downy mildew <i>F. Abdelghafour, F. Rañon, B. Keresztes, C. Germain and J.-P. Da Costa</i>	195

Image-based assessment of hyperspectral reflectance characteristics of plants in the field: Lessons Learned <i>J. Behmann, D. Bohnenkamp and A.-K. Mahlein</i>	203
Implications of dose-response relationships of herbicide droplet applications for leaf-specific weed control in leeks <i>N. Koukiasas, J. Martinez-Perez, R.A. Pilgrim, S. Sanford and A.J. Murdoch</i>	209
Exploring the factors affecting spatio-temporal variation in grapevine powdery mildew <i>R. Melyon-Delage, B. Bois, S. Zito, M. Rega, G. Garin and A. Caffarra</i>	217
Identifying the <i>Fusarium</i> spp. infestation in winter wheat based on RGB imaginary <i>G.G. Peteinatos, M. Sökefeld, J. Machleb, K. Cambel and R. Gerhards</i>	225
Marrying futuristic weed mapping with current herbicide sprayer capacities <i>G.J. Somerville, R.N. Jørgensen, O.M. Bojer, P. Rydahl, M. Dyrmann, P. Andersen, N.-P. Jensen and O. Green</i>	231
Use of simulations to study herbicide site-specific spraying <i>S. Villette, T. Maillot, J.P. Douzals, G. Jones, J.N. Paoli and J.P. Guillemain</i>	239
Section 5 – Proximal and remote sensing of soil and crop	247
Design of a portable sensor suite for real-time monitoring of crop water stress index in maize breeding plots <i>O.E. Apolo-Apolo, M. Pérez-Ruiz, J. Martínez-Guanter and G. Egea</i>	249
Characterisation of fungal diseases on winter wheat crop using proximal and remote multispectral imaging <i>R. Bebronne, A. Michez, V. Leemans, P. Vermeulen, B. Dumont and B. Mercatoris</i>	255
Assessing infield temporal and spatial variability of leaf water potential using satellite imagery and meteorological data <i>O. Beerli, R. Pelta, T. Shilo, J. Raz and S. Mey-tal</i>	263
Characterisation of cereal morphology through proximal stereo vision under contrasting nitrogen inputs <i>S. Dandrifosse, A. Bouvry, V. Leemans, B. Dumont and B. Mercatoris</i>	271
Early detection of corn and sunflower stress induced by chemical spraying <i>S. Gad, Y. Edan, T. Sandovsky, I. Harary, T. Nacson, E. Kosover, A. Levi Bar Shalom and V. Alchanatis</i>	279
Hyperspectral imaging application under field conditions: assessment of the spatio-temporal variability of grape composition within a vineyard <i>S. Gutierrez, M.P. Diago, J. Fernandez-Novales and J. Tardaguila</i>	287
Potential of optical sensors for nitrogen management in spring barley <i>R. Hackett</i>	293

Disentangling the sources of chlorophyll-content variability in banana fields <i>J. Lamour, C. Leroux, G. Le Moguédec, O. Naud, M. Léchaudel and B. Tisseyre</i>	299
Sentinel-2 vegetation indices and apparent electrical conductivity to predict barley (<i>Hordeum vulgare</i> L.) yield <i>J.A. Martínez-Casasnovas, A. Uribeetxebarria, A. Escolà and J. Arnó</i>	307
Accessing the plant architecture in 3D for plant phenotyping – recent approaches and requirements <i>S. Paulus</i>	315
Vegetation indices from remote sensing imagery as proxies for yield and grain N in wheat <i>M. Quemada, J.L. Pancorbo, M. Alonso-Ayuso, J.L. Gabriel, J. López-Herrera and E. Pérez-Martín</i>	323
Using terrestrial photogrammetry for leaf area estimation in maize under different plant growth stages <i>D. Reiser, A. Kamman, M. Vázquez Arellano and H.W. Griepentrog</i>	331
Early detection of <i>Fusarium</i> infection in corn using spectral analysis <i>T. Sandovsky, Y. Edan, S. Gad, A. Etzioni, T. Nacson and V. Alchanatis</i>	339
Proximal versus remote sensing to monitor pasture quality in a Mediterranean Montado ecosystem <i>J. Serrano, S. Shahidian, F. Moral and J. Marques da Silva</i>	347
Section 6 – Applications of unmanned aerial systems	355
Investigation of spraying efficiency of an aerial spraying system in a super-high density olive grove in Greece <i>F. Aru, A. Gertsis, G. Vellidis and F. Morari</i>	357
UAV-based hyperspectral imaging for weed discrimination in maize <i>R. Casa, S. Pascucci, S. Pignatti, A. Palombo, U. Nanni, A. Harfouche, L. Laura, M. Di Rocco and P. Fantozzi</i>	365
A precision viticulture UAV-based approach for early yield prediction in vineyard <i>S.F. Di Gennaro, P. Toscano, P. Cinat, A. Berton and A. Matese</i>	373
Estimating melon yield for breeding processes by machine-vision processing of UAV images <i>A. Kalantar, A. Dashuta, Y. Edan, A. Dafna, A. Gur and I. Klapp</i>	381
Estimation of the leaf area index in maize based on UAV imagery using deep learning techniques <i>J. Martínez-Guanter, G. Egea, M. Pérez-Ruiz and O.E. Apolo-Apolo</i>	389
A UAV-based system for monitoring crop growth in wheat, barley and triticale phenotyping field trials <i>J.M. Peña, F.J. Ostos-Garrido, J. Torres-Sánchez, F. Pistón and A.I. de Castro</i>	397

