



14th European Conference on Precision Agriculture

Bologna - Italy, 2-6 July 2023

Congress Center - Hotel Savoia Regency



UNLEASHING THE POTENTIAL OF PRECISION AGRICULTURE

PROGRAM

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PROGRAM

SUNDAY 2 JULY 2023

17.00 – 18.00	Participants' Registration
18.00 – 19.30	Welcome Cocktail

MONDAY 3 JULY 2023

ROOM 1

09.00 -11.00

PLENARY SESSION

09.00 CONVENERS OPENING & PRESENTATION OF THE CONFERENCE

09.30 WELCOME ADDRESS

10.10 – 10.55

GENERAL PERSPECTIVES10.10 *What is the adoption of Precision Agriculture over Europe? A case study on remote sensing*

T. Pavlenko (Geisenheim, Germany)

10.25 *A monitoring system to track adoption of digital technologies in agriculture over time*

A. Gabriel (Freising, Germany)

10.40 *Precision Agriculture: Addressing Adoption Gaps with Open-Source System Design*

M. L. Everett (Post Falls, United States)

11.00 COFFEE BREAK

11.30 – 15.00

AUTONOMOUS VEHICLES11.30 *Drivers for robot use in field crop farming: farmers' perspectives from four case areas in Europe*

T. W. Tamirat (Copenhagen, Denmark.)

11.45 *Economics of autonomous machines for regenerative agriculture*

A. Al Amin (Newport, United Kingdom)

12.00 *Optimal use of an agricultural robot in an arable crop rotation: a case study in the Netherlands*

J. E. Ørum (Copenhagen, Denmark.)

MONDAY 3 JULY 2023

ROOM 1

- 12.15 *Strawberry flower and fruit detection based on an autonomous imaging robot and deep learning*
W. S. Lee (Gainesville, Unites States)
- 12.30 *Follow the leader: A trajectory generator and controller for precision tree scanning*
C. Grimm (Corvallis, United States)
- 12.45 *Collaborative Smart-Robot for Yield Mapping and Harvesting Assistance*
M. N. Conejero (Madrid, Spain)
- 13.00 LUNCH
- 14.30 *Enhancing navigation benchmarking and perception data generation for row-based crops in simulation*
M. Martini (Torino, Italy)
- 14.45 *Fields2Cover open-source library: A modular approach to agricultural coverage path planning*
G. Mier (Wageningen, Netherlands)
- 15.00 – 16.00 EDUCATION AND TRAINING**
- 15.00 *How to design relevant PA training courses for technical advisors*
L. Pichon (Montpellier, France)
- 15.15 *Towards a digital twin for optimal field management*
M. Pastell (Helsinki, Finland)
- 15.30 *Gamification for communicating the advantages of precision farming: The Farming Simulator case*
D. S. Paraforos (Geisenheim, Germany)
- 15.45 *How to teach precision agriculture through reverse engineering pedagogy?*
B. Ploteau (Montpellier, France)
- 16.00 – 16.30 POSTER PRESENTATION**
- 16.30 COFFEE BREAK
- 17.00 – 18:00 POSTERS**
- Session: General perspective
- Session: Education and training
- 18.00 – 19.00 GROUP & SOCIETY MEETINGS**

MONDAY 3 JULY 2023

ROOM 2

- 09.00 -11.00 **PLENARY SESSION – (see schedule from ROOM 1)**
- 11.00 COFFEE BREAK
- 11.30 – 13.00 **SURFACE CHARACTERISATION**
- 11.30 *Crop recognition at orchard level in Mediterranean conditions using time series of spectral indexes*
H. Izquierdo (Valencia, Spain)
- 11.45 *Impact of changing attributes on the management zones for integrated crop-livestock system*
H. Oldoni (Campinas, Brasil)
- 12.00 *Technological approach to evaluate the livestock trampling effect on soil compaction*
J. M. Serrano (Evora, Portugal)
- 12.15 *Long-term evaluation of the Grassmaster II probe used to estimate productivity of dryland pastures*
J. R. Marques da Silva (Evora, Portugal)
- 12.30 *Quantifying real-time opening disk load to assess compaction and potential for planter control*
A. Sharda (Manhattan, United States)
- 12.45 *Forecasting tree crop yield with limited data - a macadamia case study*
J. Brinkhoff (Armidale, Australia)
- 13.00 LUNCH
- 14.30 *Spatio-temporal clustering analysis of soil moisture and vegetation indices for zone delineation*
B. V. Ortiz (Auburn, United States)
- 14.45 *Can the spatial structure of soil health indicators aid in Soil Health assessment?*
E. M. Pena-Yewtukhiw (Morgantown, United States)
- 15.00 *A Novel Approach of Map-Sensor-based Site-specific Nitrogen Fertilization in Winter Wheat*
M. A. Munnaf (Ghent University, Ghent, Belgium)
- 15.15 *Unleashing precision agriculture data for improve soil carbon accounting*
T. Bishop (Sydney, Australia)
- 15.30 *Farmer-led on-farm experimentation enhanced with digital agronomy*
L. Longchamps (Ithaca, United States)

MONDAY 3 JULY 2023

ROOM 2

- 15.45 POSTER PRESENTATION
- 16.15 COFFEE BREAK
- 16.45 POSTERS
- Session: Probes
- Session: Sensing
- Session: Surface Characterisation
- Session: Field Crop Characterisation & Monitoring
- 18.00 – 19.00 GROUP & SOCIETY MEETINGS

ROOM 3

- 09.00 -11.00 PLENARY SESSION – (see schedule from ROOM 1)
- 11.00 COFFEE BREAK
- 11.30 - 13.00 GENERAL METHODOLOGY
- 11.30 *Limits of Grain Yield Monitor Data to Evaluate Treatment Differences within On-farm Experimentation*
J. P. Fulton (Columbus, United States)
- 11.45 *Introducing Bayesian priors to semi-variogram parameter estimation using fewer observations*
Y. L. Zhang (Montpellier, France)
- 12.00 *A Bayesian Network approach for grain protein content prediction of winter wheat*
M. Karampoiki (Stuttgart, German)
- 12.15 *A novel approach for field sampling optimization incorporating a generic operational cost constraint*
M. Dumont (Montpellier, France)
- 12.30 *Changing How Agronomic Trials are Conducted: Modulated On Farm Response Surface Experiments (MORSE)*
S. J. Shirtliffe (Saskatoon, Canada)

MONDAY 3 JULY 2023

ROOM 3

- 12.45 *Proximal and remote sensing to define different management zone and site-specific of durum wheat crops*
E. Romano (Treviglio, Italy)
- 13.00 LUNCH
- 14.30 – 16.00 **SPATIAL METHODOLOGIES**
- 14.30 *A new metric to evaluate spatialized crop model performances*
D. Pasquel (Montpellier, France)
- 14.45 *Comparative Study of Interpolation Methods for Low-Density Sampling*
F. Hoffmann Silva Karp (Ste-Anne-de-Bellevue, Canada)
- 15.00 *A statistical test to evaluate the relevance of auxiliary time-series to predict another time series*
B. Oger (Montpellier, France)
- 15.15 *How to best compare remote sensing data versus proximal sensing data*
Y. Valloo (Montpellier, France)
- 15.30 *A scalable approach to nowcasting soil water at the within-field scale*
N. S. Wimalathunge (Sydney, Australia)
- 15.45 *Multitemporal validation of remote and proximal sensing for vineyard management zone identification*
A. Deidda (Nuoro, Italy)
- 16.00 – 16.30 **POSTER PRESENTATION**
- 16.30 COFFEE BREAK
- 17.00 **POSTERS**
- Session: General Methodology
- Session: Spatial Methodologies

TUESDAY 4 JULY 2023**ROOM 1****09.00 – 12.30****WEED & PEST MANAGEMENT**

- 09.00 *Trends and beliefs of precision farming technologies to reduce pesticide use and risks*
S. Fountas (Athens, Greece)
- 09.20 *How can Precision Agriculture contribute to the 50 % pesticide reduction of Farm-to-Fork strategy?*
A. Escolà (Lleida, Spain)
- 09.35 *Plant health assessment with thermal and multi-spectral UAV imagery in winter rye crops*
M. Schirrmann (Postdam, Germany)
- 09.50 *Sugar beet disease detection based on remote sensing data and artificial intelligence*
Y. Lebrini (Beauvais, France)
- 10.05 *Potato plant disease classification by using deep learning and sparse sensing*
A. Vončina (Ljubljana, Slovenija)
- 10.20 *Detection of Fusarium oxysporum by hyperspectral imaging in strawberry plants*
M. Perez-Ruiz (Seville, Spain)
- 11.00 **COFFEE BREAK**
- 11.30 *Almond orchards pest management using remote sensing for targeted pest control and sanitation*
A. Chen (Shmona, Israel)
- 11.45 *Establishment of a UAV-based phenotyping method for European Pear Rust in fruit orchards*
S. Reim (Dresden, Germany)
- 12.00 *Comparing satellite and high-resolution imagery for freeze damage detection in California vineyard*
B. Sams (Modesto, United States)
- 12.15 *Evaluation of the competition between barley and different weed species from RGB images*
C. Gée (Dijon, France)
- 13.00 **LUNCH**

TUESDAY 4 JULY 2023

ROOM 1

14.30 – 16.00

PESTICIDE SPRAYING

14.30

Second-generation ultrasonic sensor in precision spraying: testing and actuation range refinement

A. Pagliai (Firenze, Italy)

14.45

Studying the pneumatic system of an air-assisted sprayer for adjusting pesticide dose variations

A. Vigo-Morancho (Zaragoza, Spain)

15.00

Efficient and safe spraying applications with UAVs in viticulture: The experimental field DIWAKOPTER

B. Poss (Geisenheim, Germany)

15.15

Effects of canopy density-based airblast fan airflow adjustment on vines spray deposit

M. Grella (Torino, Italy)

15.30

Comparison between 60° and 30° hollow cone nozzles for targeted UAV-spray applications in vineyards

A. Biglia (Torino, Italy)

15.45

Adapting a conventional sprayer for real-time volume adjustment in vineyards

M. Gatti (Milano, Italy)

16.00

POSTER PRESENTATION

16.30

COFFEE BREAK

17.00

POSTERS

Session: Weed & Pest Management

Session: Pesticide Spraying

18.00 – 19.00

GROUP & SOCIETY MEETINGS

19.30

Gala Dinner

At Hotel Savoia Regency

ROOM 2

09.00 – 11.00

NUTRIENTS MANAGEMENT

09.00

Determining Site-Specific Corn Nitrogen Rate and Timing using APSIM Model

L. Thompson (Falls City, United States)

TUESDAY 4 JULY 2023

ROOM 2

- 09.15 *Evaluation of crop model-based MNR maximizing N application rates on site-specific level in maize*
E. Memic (Stuttgart, Germany)
- 09.30 *Variable rate nitrogen in a potato-wheat-wheat cropping system*
E. A. Flint (Logan, United States)
- 09.45 *Implementation of variable rate of inputs in winter crops under rainfed conditions*
M. Videgain (Zaragoza, Spain)
- 10.00 *Variable-rate fertiliser application to manage spatial variability in hilly vineyard of Prosecco PDO*
M. Sozzi (Padova, Italy)
- 10.15 *Impact of public policy strategies on the adoption of precision agriculture: the case of the Greek potato agricultural system*
G. V. Vlontzos (Volos, Greece)
- 11.00 COFFEE BREAK
- 11.30 – 16.00 **FIELD CROP CHARACTERISATION & MONITORING**
- 11.30 *Vegetation indices from Sentinel-2 and PlanetScope images and their relationship with soybean yield*
L. R. Amaral (Campinas, Brazil)
- 11.45 *Assessing the effectiveness of UAV-based multispectral imaging for detecting high-yielding varieties*
M. P. Camenzind (Freising, Germany)
- 12.00 *After harvest yield mapping of winter wheat using data from satellites and combines*
O. Alshihabi (Skara, Sweden)
- 12.15 *How accurate is straw cereal plant density estimation from spectral measurements at early stages*
T. Yang (Avignon, France)
- 12.30 *Yield prediction in winter wheat using machine learning; improving implemented farm management tool*
M. K. Langgaard (Aarhus, Denmark)

TUESDAY 4 JULY 2023

ROOM 2

- 12.45 *Assessing within-field soybean yield variability using textures over Sentinel images*
R. G. Freitas (Campinas, Brazil)
- 13.00 LUNCH
- 14.30 *Dynamic tracking of wheat senescence based on UAV multispectral imaging and leaf spectroscopy*
X. Song (Freising, Germany)
- 14.45 *Using digital soil mapping tools to assess the soil spatial variability impact on irrigated cotton*
L. N. Lacerda (Athens, United States)
- 15.00 *UAV remote sensing of agronomic parameters and yield in chickpea and lentil*
D. Marusig (Trieste, Italy)
- 15.15 *Per-parcel high-resolution mapping of critical crop-growth parameters with proximal & remote sensing*
Z. Kandylakis (Athens, Greece)
- 15.30 *A generalised approach to downscale areal-averaged yield data: a use-case in cotton quality*
M. Tilse (Sydney, Australia)
- 15.45 *Pasture quality monitoring based on proximal and remote sensors: case study in the Montado ecosystem*
J. Serrano (Evora, Portugal)
- 16.00 **POSTER PRESENTATION**
- 16.30 COFFEE BREAK
- 17.00 **POSTERS**
- Session: Nutrients Management
- Session: Water Management
- Session: Woody Crop Characterisation & Monitoring
- Session: Vineyard Characterisation & Monitoring
- 18.00 – 19.00 **GROUP & SOCIETY MEETINGS**
- 19.30 *Galá Dinner*
At Hotel Savoia Regency

TUESDAY 4 JULY 2023

ROOM 3

09.00 – 16.00

MACHINE LEARNING

- 09.00 *Integrating neural networks, clustering analysis, and remote sensing for peanut maturity prediction*
- 09.15 *A novel machine learning approach to map 3D soil constraint variability*
P. Filippi (Sydney, Australia)
- 09.30 *Early prediction of durum wheat yield in Italy using a machine learning modelling framework*
M. Fiorentini (Falconara Marittima, Italy)
- 09.45 *Use of unsupervised algorithms and auxiliary information to improve potato yield estimation*
A. Uribeetxebarria (Derio, Spain)
- 10.00 *Automatic diagnosis of a multi-symptom grapevine disease by decision trees and graph neural network*
A. Tardif (Pons, France)
- 10.15 *Grape counting in RGB videos – comparing two instance segmentation models*
M. Ariza-Sentís (Wageningen, Netherlands)
- 11.00 COFFEE BREAK
- 11.30 *Generalization of deep learning models to the semantic segmentation of natural images in vineyards*
R. Marani (Bari, Italy)
- 11.45 *Data augmentation techniques for grape bunch segmentation in natural images*
R. Escobedo (Logrono, Spain)
- 12.00 *Cassava Detection under Real Field Conditions using YOLOv5*
E. C. Nnadozie (Freising, Germany)
- 12.15 *Quantifying Wheat Spikes through Smartphone Camera and YOLOv5 under open field conditions*
F. Marinello (Padova, Italy)
- 12.30 *Apple fruit sizing through low-cost depth camera and neural network application*
G. Bortolotti (Bologna, Italy)
- 12.45 *Improving the Generalization Ability of Random Forest for Potato Chlorophyll Estimation*
Y. Haibo (Freising, Germany)
- 13.30 LUNCH

TUESDAY 4 JULY 2023**ROOM 3**

- 14.30 *Novel chestnut tree crowns segmentation method by UAV oblique photogrammetry*
L. Comba (Torino, Italy)
- 14.45 *SiaPy – user friendly software for hyperspectral image segmentation of hyperspectral images*
J. Lapajne (Ljubljana, Slovenija)
- 15.00 *Weed25: a weed database for machine learning*
P. Wang (Chongqing, China)
- 15.15 *Wheat weeds recognition using AI architecture, an open plant phenotype database and field conditions*
R. Dainelli (Firenze, Italy)
- 15.30 *Real-time Detection and Counting of Weeds in Winter Wheat Using YOLOv4 with Attention Module from UA*
P. Alirezazadeh (Postdam, Germany)
- 15.45 *Detecting and localizing mushroom clusters by a Mask R-CNN model in farm environment*
C. Charisis (Athens, Greece)
- 16.00 **POSTER PRESENTATION**
- 16.30 **COFFEE BREAK**
- 17.00 **POSTERS**
Session: Machine Learning
- 18.00 – 19.00 **GROUP & SOCIETY MEETINGS**
- 19.30 *Gala Dinner*
At Hotel Savoia Regency

WEDNESDAY 5 JULY 2023**ROOM 1**

- 09.00- 09.20 *The Italian Agritech research center for precision and sustainable agriculture*
Attilio Toscano (Università di Bologna)
- 09.20 – 09.30 *Interoperability: a key for the future of agriculture*
Alessio Bolognesi (FederUnacoma)
- 09.30 – 13.00 WATER MANAGEMENT**
- 09.30 *Stay-green monitoring for maize drought tolerance under field environments using hyperspectral data*
H. El Sharawy (Freising, Germany)
- 09.45 *Estimating Crop evapotranspiration for small plots via data fusion of spectral and SAR data*
T. Shilo (Gvat, Israel)
- 10.00 *On-Farm Evaluation of Variable Rate Irrigation for Winter Wheat in Semi-arid Western U.S.A.*
N. C. Hansen (Provo, United States)
- 10.15 *Defining Temporally Variable Urban Turfgrass Irrigation Zones with Thermal IR or ECa data*
R. Kerry (Provo, United States)
- 10.30 *Monitoring chickpea physiological traits by Sentinel-2 imagery to support irrigation management*
O. Perach (Tel Aviv, Israel)
- 10.45 *Assessment of indices calculated from remote and proximal sensing to discriminate irrigation levels*
A. Matese (Firenze, Italy)
- 11.00 COFFEE BREAK
- 11.30 *Grape yield prediction based on vine canopy morphology obtained by 3D point clouds from UAV images*
A. Šupčík (Bratislava, Slovakia)
- 11.45 *A new Leafiness-LiDAR index to estimate light interception in intensive olive orchards*
L. Sardonís-Pozo (Lleida, Spain)
- 12.00 *Using a vegetation index to define homogeneous zones for variable rate irrigation in vineyard*
M. Bolognini (Milano, Italy)

WEDNESDAY 5 JULY 2023**ROOM 1**

- 12.15 *Precision monitoring of vine water stress using UAVs and open-source processing chains*
V. Burchard-Levine (Madrid, Spain)
- 12.30 *Grapevine water status in a variably irrigated vineyard with NIR hyperspectral imaging from UAV*
L. Brillante (Fresno, United States)
- 12.45 *Water status estimation using thermal imagery at different scales in the vineyard*
I. Bahat (Luzit, Israel)
- 13.00 - 14.00 LUNCH BOX

14.00 – 18.00 FIELD VISIT**SIDE EVENT BY CONFAGRICOLTURA**  **Confagricoltura****14.30 – 18.00 EU R&I Projects on Precision Agriculture: the Confagricoltura Partnership**

Opening: The Pact for Skills and the P.A.
Dr. Daniele Rossi – Delegate R&I Confagricoltura

- Valpropath (Teagasc – Ireland 07020)
- Eco-Ready (CZU – Czech University of Prague 07027)
- Life Future Farming (AguroTech BV – The Netherlands 07026)
- H-Alo (CNR – Italy 07066)
- Waste4Soil (CERTH – Greece 07030)

Final Remarks
Francesca Marino – EU Projects Area Confagricoltura

ROOM 2**09.00 – 11.00****WOODY CROP CHARACTERIS**

- 09.00 *An online fruit counting application in apple orchards*
D. Mengoli (Bologna, Italy)
- 09.15 *UAV photogrammetry vs mobile terrestrial laser scanning for woody crops characterization*
J. Torres-Sánchez (Cordoba, Spain)

WEDNESDAY 5 JULY 2023

ROOM 2

- 09.30 *Automatic estimation of trunk cross sectional area using deep learning*
C. Grimm (Corvallis, United States)
- 09.45 *Delimiting VRI management zones in an olive grove under complex soil and terrain variability*
Vanderlinden, K. (Cordoba, Spain)
- 10.00 *Evaluating the application of multispectral proximal sensing on Ground Vehicle in an olive orchard*
C. Perna (Firenze, Italy)
- 10.15 *PRECISIONPOP: a multi-scale integrated system for poplar plantation monitoring*
M. Brambilla (Treviglio, Milano)
- 11.00 COFFEE BREAK
- 11.30 -13.00 **CROP MODELS**
- 11.30 *Does sensor choice matter for assessment of vineyard spatial variability?*
S. F. Di Gennaro (Firenze, Italy)
- 11.45 *Predicting grapevine harvest yield variables: application of a multivariate multiblock modelling*
A. Cheraiet (Montpellier, France)
- 12.00 *Mapping grape yield with low cost vehicle tracking devices*
J. P. Gras (Montpellier, France)
- 12.15 *Investigating factors influencing within-vineyard variability under different pedological contexts*
F. Graziosi (Bologna, Italy)
- 12.30 *Redesigning spatial On-Farm Precision Experiments for innovative vineyard crop protection*
O. Naud (Montpellier, France)
- 13.00 - 14.00 LUNCH BOX

14.00 – 18.00 FIELD VISIT

SIDE EVENT BY CREA

**14:30 – 18:00 Poster Session by CREA**

WEDNESDAY 5 JULY 2023

ROOM 3

09.00 – 13.00

RS SENSING

- 09.00 *Field-scale winter wheat growth monitoring and yield forecasting using SAR and optical data fusion.*
B. Buszke (Gdansk, Poland)
- 09.15 *Sensing management from space: predicting harvest dates*
S. Y. Han (Sydney, Australia)
- 09.30 *Evaluating the spectral response of cotton and corn to different cover crops using UAV imagery*
J.M.P. Czarnecki (Mississippi State, United States)
- 09.45 *Estimation of agronomic soil properties from multitemporal PRISMA satellite imaging spectroscopy*
R. Casa (Viterbo, Italy)
- 10.00 *Hyperspectral sensing and mapping of soil fertility for amending within-field heterogeneity*
Y. Inoue (Tokio, Japan)
- 10.15 *Visible-Near Infrared Diffuse Reflectance Spectra for Predicting Soil Nitrogen Mineralization Rate*
F. Y. Ruma (Ghent, Belgium)
- 11.00 COFFEE BREAK
- 11.30 *Using cover crops as reflectors of the spatial variation in soil nutrient availability*
S. I. Futerman (Kiryat Tivon, Israel)
- 11.45 *Target-N: Sentinel-2 based nitrogen optimisation in Swedish winter wheat production*
K. Persson (Skara, Sweden)
- 12.00 *Satellite-based analysis of biomass yields in heterogeneous fields*
L. Hagn (Freising, Germany)
- 12.15 *Modeling the canopy reflectance to forecast tomato biomass for the precise nitrogen management*
V. A. Cerasola (Bologna, Italy)
- 12.30 *Potential of the dark green color index for dynamic monitoring of N requirements in wheat crop*
A. S. Voisin (Dijon)
- 12.45 *Practical methods for aerial image acquisition and reflectance conversion using consumer cameras*
C. Yang (College Station, United States)

WEDNESDAY 5 JULY 2023**ROOM 3**

13.00 - 14.00 LUNCH BOX

14.00 – 18.00 **FIELD VISIT**

SIDE EVENT BY AGRITECH

14:30 – 18:00 Session by AgriTech

THURSDAY 6 JULY 2023**ROOM 1**

09.00 – 10.00 **WATER MANAGEMENT**

- 09.00 *Testing Irrigation Management Based on an Unoccupied Aerial Vehicle and an Artificial Neural Network*
O. Rozenstein (Rishon LeZion, Israel)
- 09.15 *Smart irrigation system for precision irrigation in yellow fleshed kiwifruit*
E. Baldi (Bologna, Italy)
- 09.30 *An optical trapezoid model for actual evapotranspiration based on SWIR portion of the spectrum*
A. Mokhtari (Freising, Germany)
- 09.45 *Smart Irrigation Approach to Stimulate Agro-Forestation of Native Trees in Dry Mediterranean Ecosyst*
I. Litaor (Kiryat Shmona, Israel)
- 11.00 COFFEE BREAK
- 11.30 – 13.00 **PLENARY SESSION**
- 11.30 Invited Speakers
- 12.00 Awards & Conclusion
Org. Committee

ROOM 2

09.00 – 10.15 **CROP MODELS**

- 09.00 *Combining crop growth modeling, active sensing and machine learning for precision N management*
K. Kusnierek (Kapp, Norway)

THURSDAY 6 JULY 2023

ROOM 2

- 09.15 *Integration of mechanistic model outputs as inputs into data-driven models for yield prediction*
D. Al-Shammari (Sydney, Australia)
- 09.30 *Synthetic data for site-specific crop response model using WOFOST and geostatistical simulation*
T. Tanaka (Gifu, Japan)
- 09.45 *Predicting plant-level cabbage yield using the assimilation of UAV-derived LAI into WOFOST*
Y. Yokoyama (Gifu, Japan)
- 10.00 *Evaluation of the PROMET model in on-farm research at the "Experimental Field BeSt-SH"*
B. Brandenburg (Kiel, Germany)
- 10.15 COFFEE BREAK
- 11.30 – 13.00 **PLENARY SESSION – (see schedule from ROOM 1)**

ROOM 3

- 09.00 – 10.45 **PROBES**
- 09.00 *Evaluation of portable tools for fast field assessment of winter wheat grain quality*
B. Morandin Figueiredo (Skara, Sweden)
- 09.15 *Instrumentation for On-the-Spot Measurement of Soil Health Indicators*
V. Adamchuk (Sainte-Anne-de-Bellevue, Canada)
- 09.30 *Evaluation of the Soil Quality of Chilean Orchards using SoilOptix Technology*
R. A. Ortega (Santiago, Chile)
- 09.45 *Assessment of new non-invasive roving techniques for mapping soil spatial variabilities*
S. Gianessi (Cesena, Italy)
- 10.00 *Parameters to increase LiDAR mounted UAV efficiency on agricultural field elevation measurements*
L. Bernabe Santos (Baton Rouge, United States)
- 10.15 *A Low cost sensor to improve surface irrigation management*
S. Moinard (Montpellier, France)
- 10.30 COFFEE BREAK
- 11.00– 13.00 **PLENARY SESSION – (see schedule from ROOM 1)**

POSTERS' LIST**Session: General perspective**

- P.1 *Future Crop Farming*
O. Spykman (Bavarian State Research Center for Agriculture, Germany)

Session: Education and training

- P.2 *Data and Connectivity to Foster Smallholder and Urban Farming. Farmer Charlie*
B. Bonnardel (Farmer Charlie, United Kingdom)
- P.3 *Developing a continuum of education and training pathways in integrative precision agriculture*
T. Bourlai (University of Georgia, USA)
- P.4 *Extended Classroom in Precision Agriculture as a Tool for Engineering Education*
J. A. Cardona-Gil (Universidad Pontificia Bolivariana, Colombia)
- P.5 *Resilient Smart Farming a conceptual and technological opportunity to strengthen resilience*
D. Eberz-Eder (Dienstleistungszentrum Ländlicher Raum Rheinhessen-Nahe-Hunsrück, Germany)
- P.6 *Enhancing Production Efficiency and Farm Profitability through Participatory Research*
D. Rudnick (University of Nebraska-Lincoln, USA)

Session: Autonomous Vehicles

- P.7 *Tractor Guidance Improves Environmental and Economic Gains for Pasture and Smallholder Farmers*
A. Ashworth (USDA ARS PPPSR Un. Of Arkansas, USA)
- P.8 *Legal challenges about the use of drones in PA*
B. Baldoni (University of Macerata, Italy)
- P.9 *Small robot for localized spraying using ISOBUS protocol*
J. M. Bengochea-Guevara (CSIC, Spain)
- P.10 *Autonomous coordination between UAVs and UGVs for weed detection and removal*
S. Bhandari (California State Polytechnic University, USA)
- P.11 *Allometric relationships for biomass estimation of persimmon trees using a field robot, LiDAR and photogrammetry*
J. Blasco (Instituto Valenciano de Investigaciones Agrarias, Spain)

- P.12 *Evaluation of a low-cost drone sensor to discriminate water stress levels in ornamental plants*
I. Borra-Serrano (Institute of Agricultural Sciences, Spain)
- P.13 *The aerial application of pesticides by drones: challenges and regulatory issues*
P. Lattanzi (University of Macerata, Italy)
- P.14 *Uncertainty analysis of a LiDAR-based MTLs point clouds using a high-resolution ground-truth*
B. Lavaquiol (Universitat de Lleida, Spain)
- P.15 *Performance of a Smart Autonomous Vehicle in vineyard pesticide application*
G. Piovaccari (University of Bologna, Italy)
- P.16 *Is it possible to use current auto steering system in viticulture?*
B. Tisseyre (Institut Agro Montpellier, France)
- P.17 *An AI-empowered, Autonomous Weed Removal Robotic Platform for Precision Agriculture*
F. Visentin (Università degli Studi di Verona, Italy)
- P.18 *An IoT electronic fence for agri-robots*
G. Vitali (University of Bologna, Italy)
- P.19 *Laser safety during laser-based weed control with autonomous vehicles*
M. Wollweber (Laser Zentrum Hannover e.V., Germany)

Session: Probes

- P.20 *Farmers Friendly Digital Portable Soil Testing Device*
A. Araf (IDEB Research & Technological Institute, Dhaka, Bangladesh)
- P.21 *Multichannel LiDAR supported Simultaneous Localization and Mapping In Complex Natural Environment*
E. Rihter (Faculty for Agriculture and Life sciences, Hoče, Slovenija)

Session: Sensing

- P.22 *Multispectral camera system performing real-time VRA applications toward sustainable wheat production*
N. Georgiadis (Augmenta Agriculture Technologies, Greece)

Session: Surface Characterisation

- P.23 *Soil prospection and aerial imagery in management zone delineation in a hazelnut grove in Italy*
L. Barbanti (DISTAL University of Bologna, Italy)

- P.24 *Utilizing functional soil maps for precision management for Smallholder Farmers*
P. Owens (USDA-ARS-SEA Dale Bumpers Small Farms Research Center, Booneville, USA)
- P.25 *Evaluating management, environment and spectrometer type impacts on soil texture prediction via gamma spectrometry*
S. Pätzold (University of Bonn, Germany)
- P.26 *Multilayer data and artificial intelligence for the delineation of corn management zones*
M. Pérez-Ruiz (University of Seville, Spain)
- P.27 *Satellite Remote Sensing Detects the Legacy Effects of Crop Rotation on Subsequent Crops*
J. Wang (Technical University of Munich, Germany)
- P.28 *Comparing machine learning approaches for the prediction of clay content via proximal gamma spectrometry under varying geopedological conditions*
R. Wehrle (Universität Bonn, INRES Soil Science and soil ecology, Germany)
- Session: Field Crop Characterisation & Monitoring**
- P.29 *Inoculation with biostimulants for improved plant performance under stress conditions*
K. Bradacova (University Hohenheim, Germany)
- P.30 *Quantifying within-field spatial variability in Canola Flowering for Yield Estimation*
H. Fernando (University of Saskatchewan, Canada)
- P.31 *Assessment of high cadence remote sensing data for providing phenology of key crops in Germany*
M. Grady (Planet Labs Germany GBMH, Germany)
- P.32 *Ongoing Qualitative Observations and Field Scale Maize Yield Prediction*
J. Grove (University of Kentucky, USA)
- P.33 *New methods for rapidly measuring the effect of agronomic treatments on grass growth*
E. Guest (ADAS, United Kingdom)
- P.34 *Efficient site-specific management approach using multispectral, soil, and rice based cropping data*
C. I. Jaramillo Barrios
- P.35 *Eco-innovative weeding with laser. New opportunities for improving sustainability in agriculture*
J. Krupanek (Instytut Ekologii Terenów Uprzemysłowionych, Poland)

- P.36 *Determining What Counts: Applying UAV imagery to estimate canola emergence*
K. Krys (University of Saskatchewan, Canada)
- P.37 *Application of precision farming technologies in organic farming*
M. Mittermayer (Technische Universität München, Germany)
- P.38 *UAV multi-temporal thermal imaging to evaluate wheat drought resistance*
W. Qin (Technische Universität München, Germany)
- P.39 *High-throughput spectral phenotyping of drought response in spring wheat*
R. Sadeh (Hebrew University, Israel)
- P.40 *Precision agricultural management of rice terraces using UAV in Japan*
H. Umeda (College of Bioresource Sciences, Nihon University, The Netherlands)
- P.41 *Identification of potato cultivars using multispectral imaging*
A. Vojnović (Agricultural Institute of Slovenia, Slovenia)
- P.42 *Predicting maize grain yield using UAV-based remote sensing across varieties, row spacings, and irrigation*
H. Zhang (USDA Agricultural Research Service, USA)

Session: General Methodology

- P.43 *E-Crops DSS: software architecture, technologies, main functions and examples of application*
B. Vito (Sysman Progetti & Servizi srl, Italy)
- P.44 *Stakeholders' needs and barriers to adoption of advanced digital tracking tools*
R. Addorisio (University of Bologna, Italy)
- P.45 *Does the use of multi-year data improve wheat yield prediction?*
A. Aizpurua (NEIKER, Spain)
- P.46 *Working times classification through CAN-BUS data analysis*
F. Bettucci (University of Padova, Italy)
- P.47 *Preliminary Study for the Development of Variable-Tillage Implements for Precision Farming*
A. Biglia (Università degli Studi di Torino, Italy)
- P.48 *Blockchain Implementations in Precision Agriculture*
L. Camanzi (University of Bologna, Italy)
- P.49 *Data Models in Precision Agriculture: From IoT to Big Data Analytics*
M. Francia (University of Bologna, Italy)
- P.50 *Assessing the environmental footprint of digital agriculture: research perspectives*
C. Huck (INRAE, France)
- P.51 *On the use of the driver-in-the-loop simulator approach to demonstrate the benefits of precision agriculture*

E. Leo

- P.52 *Low-cost terrestrial photogrammetry for orchard sideways 3D reconstruction*
J. A. Martínez-Casasnovas
- P.53 *Facilitating Economic Analyses of Digital Agriculture: The Role of National Statistical Offices (NSOs) and Data Collection at Scale*
J. McFadden
- P.54 *Data fusion for the decision-making process for a digitized experimental farm in Hungary*
G. Milics (Magyar Precizios Gazdalkodasi Egyesulet, Hungary)
- P.55 *Development of depth-of-tillage control system with data linkage*
E. Morimoto (Kobe University, Japan)
- P.56 *Data to Decisions: Efficient Implementation of Eco- Schemes, a Use Case for AI in Agriculture*
S. Ramm (FuE Zentrum FH Kiel GmbH, Germany)
- P.57 *Low-cost 3D modelling of crop-weed interactions*
V. Rueda-Ayala (Agroscope, Switzerland)
- P.58 *Farmwissen an innovative concept and platform for competence enhancement in Smart Farming*
E. Wölbart (Dienstleistungszentrum Ländlicher Raum Rheinhessen-Nahe-Hunsrück, Germany)

Session: Spatial Methodologies

- P.59 *Site-Specific Yield Prediction of Red Fescue (Festuca rubra L.)*
C. Andreasen (University of Copenhagen, Denmark)
- P.60 *Yield and texture based management zones in a heterogeneous Old Morainic landscape*
E. Bönecke (Leibniz institute of vegetable and ornamental crops, Germany)
- P.61 *Cropland Reference Ecological Unit for Comparative Soil Studies*
B. Maharjan (University of Nebraska – Lincoln, USA)

Session: Weed & Pest Management

- P.62 *Monitoring of insect pests and their interactions with the environmental conditions in vineyards*
V. Beranová (Comenius University Faculty of Natural Sciences, Slovakia)
- P.63 *DIGINVASIVE: a digital system to map invasive weed plants*
A. I. de Castro Megías (Spanish National Institute for Agricultural and Food Research and Technology, Spain)

- P.64 *A Processing Method for Adhesive Droplets on Images of Water-sensitive Papers*
Q. Gao (University of Padova, Italy)
- P.65 *Implementing image vision and actuation for online weed management with the aid of ISOBUS*
G. Peteinatos
- P.66 *Early assessment of tomato bacterial spot through proximal hyperspectral sensing*
M. Reis Pereira (Campus da FEUP, Portugal)
- P.67 *High power 2 μ m wavelength fiber laser for precision weeding*
P. Fuhrberg (Futronics Laser GmbH, Germany)
- P.68 *How do farmers prefer laser-weeding? A pan-European survey*
D. Tran (Ghent University, Belgium)
- P.69 *Development and validation of a method for detection of four NTX-related pesticides in plant foods*
J. Zhang (Technische Universitat Munchen, Germany)

Session: Pesticide Spraying

- P.70 *Importance of Unmanned Aerial Vehicles Settings for Spray Bait Treatments on Citrus Orchards*
P. Chueca (Instituto Valenciano de Investigaciones Agrarias, Spain)
- P.71 *Efficiency of a smart spraying technology in a fodder crop production*
L. Conceição (Polytechnic Institute of Portalegre, Portugal)
- P.72 *Development of a new Cotton Defoliation Sprayer using Unmanned Ground Vehicle*
J. M. Maja (Clemson University, USA)
- P.73 *Can UAV spraying system assist in precision crop protection?*
L. Sánchez-Fernández (Universidad de Sevilla, Spain)

Session: Nutrients Management

- P.74 *Enhancing nitrogen management through remote sensing and self-driving robots for precise nitrogen application to reduce leaching*
V. Antoniuk
- P.75 *Site-specific nitrogen management in winter wheat*
S. Heshmati (University of Hohenheim, Germany)
- P.76 *Optimal input efficiency in cotton using multispectral camera system performing real-time VRA*
V. Maggidis (Augmenta, Greece)

- P.77 *Application of model-based dynamic prescription maps for optimizing variable rate irrigation*
F. Morari (DAFNAE, Università di Padova, Italy)
- P.78 *Improving estimates of plant-available phosphorus through sensor data fusion at field scale*
S. Post (Eberswalde University of Sustainable Development, Germany)
- P.79 *Investigations of spatial nitrate leaching, the basis of innovative approaches in groundwater protection*
J. Schuster (Germany)

Session: Water Management

- P.80 *Innovative proximal soil moisture sensor for supporting irrigation scheduling in a walnut orchard*
R. Mazzoleni (University of Bologna, Italy)
- P.81 *Variable rate drip irrigation in vineyard: a case of study in Franciacorta area*
D. Modena (Università di Milano, Italy)
- P.82 *In-season crop model autocalibration for variable rate nitrogen fertilization in winter wheat*
F. Morari (DAFNAE, Università di Padova, Italy)
- P.83 *High-resolution soil moisture mapping in micro-irrigated orchards by on-the-go microwave radiometry*
E. Scudiero (University of California, Riverside, USA)
- P.84 *Use of remote sensing and machine learning techniques to study the impact of climate extremes of crop evapotranspiration*
V. Sharda (Kansas State University, USA)

Session: Woody Crop Characterisation & Monitoring

- P.85 *Development of a high-throughput monitoring system for fire blight in fruit orchards*
V. Maß (Leibniz Institute for Agricultural Engineering and Bioeconomy, Germany)
- P.86 *High-efficiency harvesting of jujube by air suction harvester: suction pipe gas MHD acceleration control*
J. Nie (Shihezi University, China)
- P.87 *Yield prediction in different fruit species using systematic sampling*
R. Ortega (Universidad Tecnica Federico Santa Maria, Chile)
- P.88 *Automated apple orchard blossom mapping from drone image analysis*
M. Piani (University of Bologna, Italy)

- P.89 *Quantifying temperature on apple surface by means of thermal point cloud*
N. Tsoulas (Leibniz Institute of Agricultural Engineering and Bio-economy, Germany)
- P.90 *Automatic detection of woody crop diseases combining aerial-ground robots and network sensors: An upscaling remote sensing approach*
J. Valente (Wageningen University, Netherlands)
- P.91 *Detection of Citrus bark cracking viroid (CBCVd) on hop (Humulus lupulus) using multispectral imaging*
U. Žibrat (Agricultural institute of Slovenia, Slovenia)

Session: Vineyard Characterisation & Monitoring

- P.92 *A novel fruit-zone cooling system to face multiple summer stress in Pignoletto cv*
G. Allegro (University of Bologna, Italy)
- P.93 *Complementarity between manual measurements and image analysis for grape yield estimation.*
C. Germain (Laboratoire IMS, France)
- P.94 *Vinelapse: an autonomous grapevine observation image sensor*
F. Rançon (Bordeaux Sciences Agro, France)
- P.95 *Detection of damaged white grape bunches*
A. Ribeiro (Centre for Automation and Robotics, Spain)
- P.96 *Early detection of Botrytis cinerea infection in plants by pulsed thermography*
M. Rippa
- P.97 *LIDAR and Multispectral 3D data fusion for identifying fungal disease traits in vineyards*
S. Vélez (Wageningen University & Research, Netherlands)

Session: Machine Learning

- P.98 *Machine learning based prediction of soil total nitrogen by using hyper-spectral data in laboratory*
Y. Afrasiabian (Technische Universität München, Germany)
- P.99 *Development of an On-line Object Detection Neural Network for weed detection in Tomato Crops*
D. Andujar (Consejo Superior Investigaciones Científicas, Spain)
- P.100 *Machine Learning regression for Leaf Nitrogen Content Prediction throughout the entire lifecycle of Sugarbeet crops in Spain*
M. Cabrera Dengra

- P.101 *Sub-field Scale Soil Salinity Prediction using Machine Learning Algorithms with Remotely Sensed Data in the Prairie Area of Saskatchewan, Canada*
T. Ha (University of Saskatchewan, Canada)
- P.102 *Machine Learning image classifier: autonomous fertilization management of indoor baby leaf lettuce*
M. Landolfo
- P.103 *Development of a prototype mobile app for crop weight estimation using AI techniques*
S. Lee (APEC Climate Center, Republic of Korea)
- P.104 *A Non-invasive Method of Monitoring the Growth of Individual Melons using UAVs and Machine Learning*
P. Majewski (Wroclaw University of Science and Technology, Poland)
- P.105 *Detection of Conyza spp in a hedgerow olive orchard by deep learning convolutional neural networks*
F. J. Mesas-Carrascosa (Institute for Sustainable Agriculture, Spain)
- P.106 *Cognitive computing for classification of six weed species in tomato and maize crops.*
G. Mesías-Ruiz (Spanish National Research Council, Spain)
- P.107 *A mobile phone-based tomato maturity monitoring system using identification markers*
K. Morita (University of Tokyo, Japan)
- P.108 *Transfer and zero-shot learning for weed species detection with small datasets and unseen classes*
J. M. Peña (Spanish National Research Council, Spain)
- P.109 *Development of multimodal machine learning model for wheat traits assessment under climate change*
A. Pivchenko (The Hebrew University of Jerusalem, Israel)
- P.110 *Seed Spacing Estimation using CNNs and Seed Localization Sensing System*
A. Sharda (Kansas State University, USA)
- P.111 *Using shape and color to identify weeds. A review for Eastern and Central Europe*
C. D. Utoiu
- P.112 *Optimization algorithms for plant segmentation of point clouds onboard agricultural robots*
C. Valero (Universidad Politecnica de Madrid, Spain)
- P.113 *Active vision and multi-view perception to efficiently tomato target part in high clutter scenario*
W. Xin (Wageningen University and Research, Netherlands)