



# 9<sup>th</sup> European Conference on Precision Agriculture

Facing new challenges, providing new solutions

Lleida, Catalonia , Spain  
July 7<sup>th</sup>-11<sup>th</sup> 2013



Universitat  
de Lleida



Grup de Recerca en Agròtica  
i Agricultura de Precisió  
Research Group on Agronomy & Precision Agriculture



International Society of Precision Agriculture



# **9<sup>th</sup> European Conference on Precision Agriculture**

**Facing new challenges, providing new solutions**

**[www.ecpa2013.udl.cat](http://www.ecpa2013.udl.cat)**



## Welcome



Dear colleagues,

It is with great pleasure that we welcome you at the 9<sup>th</sup> European Conference on Precision Agriculture (ECPA'13) that takes place in Lleida (Catalonia, Spain), under the auspices of the International Society of Precision Agriculture (ISPA) and the *Universitat de Lleida* (UdL).

Lleida is a very important fresh fruit and wine production area in Catalonia and in Spain. Unfortunately, Precision Fructiculture is still far away of being adopted on a regular commercial basis. The *Universitat de Lleida* and specifically the *Escola Tècnica Superior d'Enginyeria Agrària de Lleida* (School of Agricultural and Forestry Engineering of Lleida) are working on developing tools for PA. Hosting such an important event as ECPA will surely help our region and other related areas to realize that PA is part of the future.

PA is as an important issue now as when first developing in the late 80s/early 90s. The size of ECPA meetings allows focusing on specific topics related to all PA practices while discovering what our colleagues are working on, enabling synergies and co-operation. In addition, ECPA'13 keeps the standards of its Proceedings following an accurate edition and asking the Scientific Committee to carefully assess the papers.

This is the program of the ECPA'13 which provides you with all the information related to the conference. Check the program regularly so that you can take advantage of all scheduled activities.

We are grateful to the *Universitat de Lleida* and the International Society of Precision Agriculture (ISPA) for backing us in the organization of this event.

Finally, we hope you have a pleasant stay in Lleida and that the Conference allows you to know the new achievements presented in the domain of PA to face challenges and provide solutions in agriculture.

Enjoy the Conference!

The Organizing Committee



## Organizing Committee

### Chairman

Dr. Alexandre Escolà (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

### Vice-chairmen

Dr. Joan R. Rosell (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Dr. Jaume Arnó (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

### Members

Dr. Ricardo Sanz (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Dr. Joan Masip (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Dr. Lluís Puigdomènech (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Dr. Eduard Gregorio (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Eng. Felip Gracia (Research Group on AgrolCT & Precision Agriculture - GRAP, Generalitat de Catalunya-DAAM)

Dr. Francesc Solanelles (Research Group on AgrolCT & Precision Agriculture - GRAP, Generalitat de Catalunya-DAAM)

Eng. Ferran Camp (Research Group on AgrolCT & Precision Agriculture - GRAP, Generalitat de Catalunya-DAAM)

Dr. Jesús Pomar (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Dr. Santiago Planas (Research Group on AgrolCT & Precision Agriculture - GRAP, Universitat de Lleida)

Dr. Emilio Gil (Universitat Politècnica de Catalunya)

Dr. John Stafford (Program Committee of the ECPA, President of ISPA)

Dr. Raj Khosla (Past-President of ISPA)

We specially wish to thank **Dr. John Stafford and Dr. Raj Khosla** for joining the Organizing Committee owing to their responsibilities as indicated above.

## Research Group on AgrolCT & Precision Agriculture (GRAP)

Most of the members of the organizing committee are part of the Research Group on AgrolCT & Precision Agriculture - GRAP. This research group started its activity as an official group in 2004 putting together the previous research lines and experience of its researchers. The research lines of the group are mainly focused on the development of Precision Fructiculture tools and on Pig Precision Feeding Systems, the main agricultural activities of the area.

For more information, please visit [www.grap.udl.cat](http://www.grap.udl.cat)





# 9<sup>th</sup> European Conference on Precision Agriculture



	Sunday 7/7/2013	Monday 7/8/2013	Tuesday 7/9/2013	Wednesday 7/10/2013	Thursday 7/11/2013
8:00		Registration	Registration	Transfer to Raimat	
9:00		PLENARY SESSION Welcome	PLENARY SESSION		ROUNDTABLE DISCUSSION
10:00		Keynotes Dr. Lowenberg- DeBoer Dr. Gebbers	Keynotes Dr. Fountas Dr. Tisseyre	FIELD DEMO	Moderator Dr. Khosla
11:00		Coffee break POSTER SESSION Contact with companies Networking	Coffee break POSTER SESSION Contact with companies Networking		Coffee break
12:00				Transfer to hotels	CLOSING CEREMONY
13:00					
14:00		Lunch	Lunch	Lunch	Lunch
15:00					
16:00					
17:00		Gold sponsor technical session	Gold sponsor technical session	Coffee break	
18:00		Coffee break	Coffee break		
19:00				Evening events	
20:00		Evening events	Evening events		
21:00	Welcome reception at the Seu Vella (Lleida's old cathedral)			Transfer to dinner	
22:00				Conference Dinner	
23:00					
	Sunday 7/7/2013	Monday 7/8/2013	Tuesday 7/9/2013	Wednesday 7/10/2013	Thursday 7/11/2013

- Soil and crop proximal sensors
- Remote sensing applications in precision agriculture
- Spatial variability and mapping
- Machinery, Robotics and PA technologies
- Management, data analyses and decision support systems
- Precision crop protection
- Advances in precision fructiculture / viticulture/ oliviculture and horticulture in general
- Advances in precision irrigation
- Economics, practical adoption and emerging issues

Detailed program



# Cappont Campus Map

Lleida has been a university city since 1300. Nowadays, the University of Lleida has a number of campuses scattered across the city. Each building and its surroundings is part of an interrelated system that constitutes a functional unit, which blends into the urban fabric. Each campus has been designed to create a pleasant academic atmosphere that is conducive to study, research and debate.

The newest university campus is the Cappont Campus, where the 9 ECPA will take place. It lies on the left bank of the River Segre between two of the city bridges. Along the river there is the campus library, which is in a building that was designed by Kristian Guilische to mark the 700<sup>th</sup> anniversary of the Estudi General de Lleida, the Polytechnical School, the Faculty of Law and Economics, the Faculty of Educational Sciences, a university hall of residence, an academic management building and a block of classrooms.



1

CCCT Building - *Edifici CCCT*  
C/ Jaume II, 67

Registration desk  
Plenary sessions  
Poster sessions  
Gold sponsor technical sessions  
Companies zone  
Library  
Coffee breaks  
Computer room

2

Multipurpose Building - *Edifici Polivalent*  
C/ Jaume II, 71

Bar restaurant

3

Faculty of Law and Economy - *Facultat de Dret i Economia*  
C/ Jaume II, 73

Technical sessions





# Keynote speakers

We are pleased to introduce the keynote speakers of the 9th ECPA conference. We will have two plenary sessions with two keynote lectures each one. On Monday July 8th, Dr. Lowenberg-DeBoer will report on Precision Agriculture implementation and afterwards Dr. Gebbers will discuss PA perspectives. On Tuesday July 9th, Dr. Fountas will review Precision Horticulture state-of-the-art and Dr. Tisseyre will describe the status of Precision Viticulture.



**Dr. James M Lowenberg-DeBoer** has 30 years of worldwide experience in agricultural research, teaching, outreach and administration. He currently serves as Associate Dean and Director of International Programs in Agriculture at Purdue University, coordinating all international programs for the Purdue College of Agriculture. His research focuses on the economics of agricultural technology. He has published 71 articles in refereed journals, two books and chapters in six other books. He is a pioneer in the use of spatial regression in analysis of crop sensor data with published work in this area from the U.S., Argentina and South Africa. He received the Precision Agriculture Legacy Award for his work on the profitability and adoption of site specific crop management technology. He is PI for the Purdue Improved Cowpea Storage project funded by the Bill & Melinda Gates Foundation. His work has taken him to 47 countries. He brings to his research, teaching, outreach and administration a perspective gained through private sector experience as a farmer and journalist.



**Dr. Bruno Tisseyre** was graduated “engineer” in Agronomy (MSc) at AgroSup Dijon (Burgundy) in 1991. He was graduated Doctor in “Agronomy” in 1996 at Montpellier SupAgro (National Institute for Higher Education in Agriculture and Natural Resources) and entered Montpellier SupAgro as assistant professor in 1996. In 2003, he spent a sabbatical at the University of Sydney (Australian Centre for Precision Agriculture). In 2012, he was graduated at the highest degree at Montpellier SupAgro. He extended his research on precision viticulture. He initiated and led various research projects in this field, both at national and European level, with academic partners as well as with private companies. These projects focused on i) spatial data fusion, ii) segmentation and zoning, iii) characterization of the spatial variability and assessment of the ability to manage the within field variability (opportunity index of Site specific management), iv) spatial extrapolation (mainly in vine water status). In remote sensing, the research led to release a remote sensing commercial service specifically dedicated to viticulture (Oenoview) in collaboration with the Institut cooperative du



**Dr. Robin Gebbers** has studied agronomy (agro-ecology) in Rostock, Germany. He was involved in research projects on low-cost remote sensing, site-specific fertilization and geo-electrical soil mapping before he started working at the Leibniz-Institute of Agricultural Engineering in Potsdam, Germany in 2006. There he finished his PhD on “Accuracy Assessment in the System of Site-Specific Base Fertilization”. At the same institute he is now a senior scientist and the coordinator of research on “precision farming and precision livestock farming”. The team comprises about 20 scientists. His research interests are in proximal soil sensing, crop sensing and spatial data analysis for precision agriculture. Among his main publications were book chapters for Margaret Oliver’s “Geostatistical Applications for Precision Agriculture” and Martin Trauth’s “MATLAB Recipes for Earth Sciences” as well as an invited review paper on “Precision Agriculture and Food Security” in Science, co-authored by Viacheslav Adamchuk.






**Dr. Spyros Fountas** was graduated as Agricultural Engineer from Aristotle University of Thessaloniki, Greece in 1993. He did his MSc in Management Information Systems at Cranfield University, UK in 1998. He acquired his PhD at Copenhagen University, Denmark (former KVL) in 2004 in “Systems Analysis for Precision Agriculture”. He was also visiting scholar at Purdue University, USA in 2002. He has industrial experience from Novartis Crop Protection, UK, Monsanto Agrochemicals and Kubota tractors and Kalamata farmers union. He is now Assistant Professor at the University of Thessaly, Greece. He has participated in a number of national and European projects related to precision agriculture such as FP7 FutureFarm, ICT-Agri I Robo-Farm and ICT-Agri II User-PA. He was co-organizer of the 6th ECPA in Skiathos, Greece in 2007. He is in the Editorial Board at the journals of Precision Agriculture and Computers and Electronics in Agriculture. He has 32 journal papers, 60 conference papers, 8 book chapters and 560 citations. His research interests are managing spatial and temporal variability in high value crops and design and implementation of farm management information systems.



## Monday

## Oral presentations

	 Soil and crop proximal sensors	 Precision Crop Protection	 Advances in precision fructiculture/ viticulture/ oliviculture and horticulture in general
	<i>Soil and crop proximal sensors I</i> Chairman: V.Adamchuk / Room: FDE, -1.03	<i>Precision Crop Protection I</i> Chairman: B.Panneton / Room: FDE, -1.04	<i>Advances in precision viticulture I</i> Chairman: B.Tisseyre / Room: FDE, -1.02
12:00-12:20	15508 - <b>Serrano, J.</b> - Comparing the DUALEM and VÉRIS sensors for mapping soil properties	15666 - <b>Nielsen, M.R.</b> - Gall mite inspection on dormant black currant buds using machine vision	15803 - <b>Rinaldi, M.</b> - Electronic characterization of the phenological stages of grapevine using a LIDAR sensor
12:20-12:40	15606 - <b>Piikki, K.</b> - Three-layered soil maps based on sensor measurements	15662 - <b>Garin, G.</b> - Assembly of a model for grapevine powdery mildew in a decision support system and search for evaluation criteria	15794 - <b>Bonilla, I.</b> - Grape quality assessment by airborne remote sensing over three years
12:40-13:00	15741 - <b>Silva, F.C.S.</b> - Real time soil sensing for determination of tropical soils pH	15799 - <b>Planas, S.</b> - Advances in pesticide dose adjustment in tree crops	15663 - <b>Tardáguila, J.</b> - Multispectral imagery acquired from a UAV to assess the spatial variability of a Tempranillo vineyard
13:00-13:20	15752 - <b>Perez-Ruiz, M.</b> - Soil compaction sensor for site-specific tillage: design and assessment	15816 - <b>Marucco, P.</b> - Automatic selection of vertical pattern in orchard sprayer	15564 - <b>Martínez-Casasnovas, J.A.</b> - A simplified index to assess the opportunity for selective wine grape harvesting from vigour maps
	<i>Soil and crop proximal sensors II</i> Chairman: E.Moltó / Room: FDE, -1.03	<i>Precision Crop Protection II</i> Chairman: C. Fernández / Room: FDE, -1.04	<i>Advances in precision viticulture II</i> Chairman: R.Bramley / Room: FDE, -1.02
15:00-15:20	15710 - <b>Shoji, K.</b> - Microphone sensor for grain yield monitoring	15738 - <b>Andújar, D.</b> - Weed-crop discrimination using LiDAR measurements	15635 - <b>Fountas, S.</b> - Using laser scanner to map pruning wood in vineyards
15:20-15:40	15615 - <b>Weis, M.</b> - Improving the determination of plant characteristics by fusion of six different sensors	15768 - <b>San Martín, C.</b> - Simulation of the effects of weed decision threshold, detection and treatment resolution on the errors in spraying decisions and on herbicide savings	15681 - <b>Santesteban, L.G.</b> - Agronomic significance of the zones defined within vineyards early in the season using NDVI and fruit load information
15:40-16:00	15587 - <b>Marinello, F.</b> - Three-dimensional sensor for dynamic characterization of soil microrelief	15597 - <b>Moshou, D.</b> - Crop and weed species recognition based on hyperspectral sensing and active learning	15706 - <b>Smart, D.R.</b> - Grape physiology, composition and sensory characteristics in a selective harvest winegrape vineyard
16:00-16:20	15754 - <b>Gebbers, R.</b> - Crop sensor readings in winter wheat as affected by nitrogen and water supply	15714 - <b>Cohen, Y.</b> - Effect of historical agronomic practices and proximity of infected plots on spatial patterns of broomrape in tomato crops	15730 - <b>Taylor, J.A.</b> - Temporal evolution of within-season vineyard canopy response from a proximal sensing system
	<i>Soil and crop proximal sensors III</i> Chairman: R. Gebbers / Room: FDE, -1.03	<i>Precision Crop Protection III</i> Chairman: F. Solanellas / Room: FDE, -1.04	<i>Advances in precision fructiculture III</i> Chairman: J.Schueller / Room: FDE, -1.02
17:40-18:00	15568 - <b>Zhou, L.Q.</b> - Rapid estimation of rice canopy LAI using multi-source proximal sensors	15570 - <b>Vulgarakis Minov, S.</b> - Spray nozzle characterization using high speed imaging techniques	15595 - <b>Selbeck, J.</b> - Automated determination of plum tree canopy cover with two different measurement techniques
18:00-18:20	15631 - <b>Cao, Q.</b> - Estimating rice nitrogen status with Crop Circle multispectral active canopy sensor	15629 - <b>Balasundram, S.K.</b> - Site-specific disease management: A preliminary case with Orange Spotting in oil palm	15750 - <b>Liakos, V.</b> - Application of variable rate fertilizer in a commercial apple orchard
18:20-18:40	15579 - <b>Amaral, L.R.</b> - Comparison of crop canopy sensors in sugarcane	15639 - <b>Cosby, A.</b> - Mapping redheaded cockchafer infestations in pastures – are PA tools up to the job?	15572 - <b>Colaço, A.F.</b> - Obtaining yield maps in orchards by tracking machine behavior
18:40-19:00	15776 - <b>Portz, G.</b> - Field comparison of ultrasonic and canopy reflectance sensors used to estimate biomass and N-uptake in sugarcane	15712 - <b>Cohen, Y.</b> - Risk assessment of grapevine leafroll disease for developing future site-specific disease spread control tactics and strategies	15758 - <b>Agüera Vega, J.</b> - Determination of field capacity and yield mapping in olive harvesting using remote data acquisition





# Tuesday

## Oral presentations



### Soil and crop proximal sensors

*Soil and crop proximal sensors IV  
Chairman: J.R. Rosell-Polo / Room: FDE, -1.03*

15637 - **Van Evert, F.K.** - From theory to practice: using canopy reflectance to determine sidedress N rate in potatoes

15772 - **Chatzinikos, A.** - The use of laser scanner for measuring crop properties in three different crops in Central Greece

15780 - **Grove, J.H.** - The problem is not N deficiency: Active canopy sensors and chlorophyll meters detect P stress in corn and soybean

15578 - **Varco, J.** - Development of sensor based detection of crop nitrogen status for utilization in variable rate nitrogen fertilization

### Economics, practical adoption and emerging issues

*Economics, practical adoption and...I  
Chairman: J.M. Lowenberg / Room: FDE, -1.03*

15561 - **Schieffer, J.** - Precision agriculture and agro-environmental policy

15603 - **Dillon, C.R.** - Heuristic optimization for variable rate nitrogen and seeding decisions

15605 - **Dillon, C.R.** - Dispelling misperceptions regarding variable rate applications

15611 - **Martínez-Casasnovas, J.A.** - Precision analysis of the effect of ephemeral gully erosion on vine vigour using NDVI images

*Economics, practical adoption and...II  
Chairman: C.Dillon / Room: FDE, -1.03*

15699 - **Kester, C.** - A survey of future farm automation: A descriptive analysis of survey responses

15499 - **Klingner, S.** - Challenges for Service Engineering in the Domain of Precision Farming

15651 - **García-Vidal, J.** - A survey of wireless sensor technologies applied to precision agriculture

15556 - **Korduan, P.** - Standardisation through INSPIRE



### Management, data analyses and decision support systems

*Management, data analyses and decision...I  
Chairman: J.Stafford / Room: FDE, -1.04*

15785 - **Khosla, R.** - Can fluorescence based sensing detect nitrogen deficiency at early growth stages of maize?

15719 - **McEntee, P.** - Sub-paddock scale spatial variability between the pasture and cropping phases of mixed farming systems in Australia

15627 - **Kulczycki, G.** - The effect of long-term phosphorus and potassium precision fertilization

15685 - **Adamchuk, V.I.** - Theoretical basis for sensor-based in-season nitrogen management

*Management, data analyses and decision...II  
Chairman: R.Khosla / Room: FDE, -1.04*

15693 - **De Oliveira, R.P.** - A segmentation approach to delineate zones for differential nitrogen interventions

15607 - **Kielhorn, A.** - Practicable site-specific estimation of nitrate leaching risk from agricultural cropland

15654 - **Dumont, B.** - Yield variability linked to climate uncertainty and nitrogen fertilisation

15746 - **Liakos, V.** - Variable rate application of side-dress nitrogen on cotton in Georgia, USA

*Management, data analyses and decision...III  
Chairman: J.Taylor / Room: FDE, -1.04*

15755 - **Nyéki, A.** - Improving yield advisory models for precision agriculture with special regards to soil compaction in maize production

15528 - **Guaus, A.** - A model-driven decision support system for vineyard water status management: a time-dependent sensitivity analysis

15747 - **Santesteban, L.G.** - Prediction of spatial variability of water status in a rain fed vineyard in Spain



### Spatial variability and mapping

*Spatial variability and mapping I  
Chairman: R.Ferguson / Room: FDE, 0.36*

15502 - **Serrano, J.** - Long-term effect of super phosphate fertilizer on accumulation of soil phosphorus on a pasture

15770 - **Adamchuk, V.I.** - Effect of sampling patterns and interpolation methods on prediction quality of soil variability mapping

15519 - **Tisseyre, B.** - Spatial variability of drip irrigation in small vine fields of south of France

15565 - **Anselmi, A.A.** - A simple method for filtering spatial data

15521 - **Hoffmeister, D.** - Spatial variability detection of crop height in a single field by terrestrial laser scanning

*Spatial variability and mapping II  
Chairman: M.Söderström / Room: FDE, 0.36*

15786 - **Pena-Yewtukhiw, E.M.** - Strip-crop rotations: Yield spatial structure for spatially coincident and temporally subsequent corn and soybean production

15781 - **Conceição, L.A.** - Spatial variability of seed depth placement of maize under no tillage in Alentejo, Portugal

15722 - **Grifo, A.R.L.** - Stochastic simulation of maize productivity: spatial and temporal uncertainty

15571 - **Vieira, S.** - Spatial and temporal variability of soybean and maize yield after 27 years of no-tillage in São Paulo, Brazil

*Spatial variability and mapping III  
Chairman: J.A.Martínez / Room: FDE, 0.36*

15554 - **Kerry, R.** - Investigating geostatistical methods to model within-field yield variability of cranberries

15601 - **Zane, L.** - Within-field zoning using a region growing algorithm guided by geostatistical analysis

15657 - **Morari, F.** - Understanding the effects of site-specific fertilization on yield and protein content in durum wheat

15618 - **Söderström, M.** - Within-field variation in deoxynivalenol (DON) contents in oats



### Remote sensing

*Remote sensing I  
Chairman: P.Zarco-Tejada / Room: FDE, -1.02*

15705 - **Peteinatos, G.G.** - Enhancement of micro Unmanned Aerial Vehicles for agricultural aerial sensor systems

15778 - **Van Der Wal, T.** - Fieldcopter: Unmanned Aerial Systems for crop monitoring services

15518 - **Meron, M.** - Aerial thermography for crop stress evaluation – a look into the state of the technology

15723 - **Alchanatis, V.** - Comparison of methods for field scale mapping of plant water status using aerial thermal imagery

*Remote sensing II  
Chairman: V.Alchanatis / Room: FDE, -1.02*

15588 - **Torres-Sánchez, J.** - Imagery from unmanned aerial vehicles for early site specific weed management

15797 - **Matese, A.** - Mapping of vine vigor by UAV and anthocyanin content by a non-destructive fluorescence technique

15532 - **Meng, J.H.** - Predicting optimal soybean harvesting dates with satellite data

15680 - **Jiao, S.H.** - Monitoring time-series crop leaf area index from higher resolution remotely sensed data

*Remote sensing III  
Chairman: V.Alchanatis / Room: FDE, -1.02*

15773 - **Alsina, M.M.** - Water status detection in California table grapes: from leaf to airborne

15600 - **Vincini, M.** - Portability of leaf chlorophyll empirical estimators obtained at Sentinel-2 spectral resolution

## Wednesday

### Oral presentations



Management, data analyses and  
decision support systems



Advances in precision irrigation



Machinery, Robotics and PA  
technologies

*Management, data analyses and decision...IV*  
Chairman: S. Fountas / Room: FDE, -1.04

*Advances in precision irrigation I*  
Chairman: M. Meron / Room: FDE, -1.02

*Machinery, Robotics and PA technologies I*  
Chairman: H. Griepentrog / Room: FDE, -1.03

15:00-15:20

15743 - **Li, M.Z.** - A field information  
collecting system based on a wire-  
less sensor network

15536 - **Bellvert, J.** - Scheduling  
vineyard irrigation based on mapping  
leaf water potential from airborne  
thermal imagery

15775 - **Stenberg, B.** - On-line me-  
asurement of animal and bio slurry  
quality variations with near infrared  
spectroscopy

15:20-15:40

15523 - **Halcro, G.** - Site-specific  
land management of cereal crops  
based on management zone deline-  
ation by proximal soil sensing

15670 - **Jiménez Bello, M.A.** - As-  
sessment of drip irrigation sub-units  
using airborne thermal imagery  
acquired with an Unmanned Aerial  
Vehicle (UAV)

15749 - **Tsiropoulos, Z.** - Manage-  
ment information system for spatial  
analysis of tractor-implement draft  
forces

15:40-16:00

15619 - **Taylor, J.A.** - A comparison  
of bivariate classification and seg-  
mentation approaches to delineating  
and interpreting grain yield-protein  
management units

15798 - **Patil, V.C.** - Response of  
alfalfa to precision fertigation in  
Saudi Arabia

15592 - **Vellidis, G.** - Using RTK-ba-  
sed GPS guidance for planting and  
inverting peanuts

16:00-16:20

15665 - **Griffin, S.** - Using profile soil  
electrical conductivity survey data to  
predict wheat establishment rates in  
the United Kingdom

15713 - **Rud, R.** - The potential of  
CWSI based on thermal imagery for  
in-season irrigation management in  
potato fields

*Management, data analyses and decision...V*  
Chairman: J. Arnó / Room: FDE, -1.04

*Advances in precision irrigation II*  
Chairman: T. Shaver / Room: FDE, -1.02

*Machinery, Robotics and PA technologies II*  
Chairman: A. Escolà / Room: FDE, -1.03

17:10-17:30

15725 - **Gólaszewski, J.** - Geosta-  
tistical methods as auxiliary tools in  
field plot experimentation

15757 - **Ferguson, R.** - Variable  
Rate Irrigation and Nitrogen Ferti-  
lization of Maize across Landscape  
Positions

15562 - **Raush, G.** - Hydraulic robot  
arm controlled by visual servoing

17:30-17:50

15715 - **Mansouri, M.** - Prediction of  
non-linear time-variant dynamic crop  
model using bayesian methods

15591 - **Vellidis, G.** - A soil moisture  
sensor-based variable rate irrigation  
scheduling system

15748 - **Conesa-Muñoz, J.** - Path  
planning to minimise distances and  
recharging instances for a small fleet  
of vehicles in an arable field

17:50-18:10

15805 - **Mouazen, A.M.** - Fusion  
of data from multiple soil sensors  
for the delineation of water holding  
capacity zones





# Poster presentations

Posters will be permanently exposed on Monday and Tuesday.

Authors are supposed to be nearby the corresponding posters during the coffee break in the morning.



## Soil and crop proximal sensors

Tamura, E.	Evaluation of NITROGEN nutritional conditions by analyzing HYPERSPECTRAL DATA
Moreno, J.	Compact and LOW COST embedded vision system for FRUIT DETECTION and TRACKING
Shoji, K.	Determination of MOISTURE content and NITROGEN concentration in the SOIL by measuring dielectric properties using parallel circuit RESONANCE
Minzan, L. A	Vehicle-mounted CROP DETECTOR with WIRELESS Sensor NETWORK
Minzan, L.	REAL TIME analysis of SOIL NITROGEN content based on a portable soil sensor
Peteinatos, G.G.	COMPARISON of ISARIA® sensor with a typical SPECTROMETER under diverse conditions
Kusnierek, K.	Combining thermal and spectral data to account for water stress at split-fertilization of wheat
Armesto, A.P.	Integration of a Decision Support Tool (HAD NITRO) with the N-Sensor® for variable rate NITROGEN top-dressing in WINTER CEREALS



## Remote sensing applications in precision agriculture

El Nahry, A.H.	Precision Farming in New Reclaimed Areas Using Remote Sensing and GIS Techniques
Serrano, L.	Assessment of BERRY QUALITY using AIRBORNE derived NDVI and PRI in rainfed vineyards
Bellvert, J.	INNPACTO project: A tool for scheduling IRRIGATION using airborne high resolution THERMAL IMAGERY
Hongo, C.	Evaluation of SOIL CARBON stocks in upland field using remotely sensed data
de Castro, A.I.	In-season Site-specific Control of Cruciferous WEEDS at Broad-scale using QUICKBIRD IMAGERY
Gómez-Candón, D.	Accuracy and crop line misalignment over HIGH RESOLUTION ORTHO-MOSAICS from UNMANNED AERIAL VEHICLES
Karakizi, C.	VINEYARD DETECTION and VINE VARIETY DISCRIMINATION from high resolution SATELLITE DATA
García-Ruiz, F.	Sensing crop heterogeneity by use of unmanned aircraft systems (UAS)



## Spatial variability and mapping

Bergonzoli, S.	Spatial variability of some SOIL properties and WHEAT YIELD within a trafficked field
Eroglu, M.C.	Spatial mapping and analysis of GRAIN LOSS determined under different operational parameters of combine harvesters in WHEAT HARVESTING
Zhang, M.	A thematic map of SOIL HEAVY METAL elements: DISTRIBUTION and release
Hinck, S.	Sample reduced SITE MAPPING – a combination of GEOELECTRIC measurements and field mapping
Unamunzaga, O.	Study of spatial variability of SOIL physical properties in a VINEYARD
Sartori, A.	Spatial variability of SOIL physical properties with different doses of SEWAGE SLUDGE
Moraes, D.	Spatial variability of estimated ATRAZINE concentrations in GROUNDWATER
Golaszewski, J	Use of INFORMATION on spatial variability in FRACTIONAL EXPERIMENTS 212-8 with winter rye (Secale cereale L.)
Agüera-Vega, J.	IN-FIELD SPATIAL grain-legume YIELD VARIABILITY under NO-TILL and CONVENTIONAL TILLAGE
Piñuan, J.	Three-point hitch dynamometer and GPS system for tillage forces and power requirements mapping



## Machinery, Robotics and PA technologies

Andújar, D	Automatic adjustment of a flexible tine harrow using ultrasonic sensors for on-line weed detection
Griepentrog, H.W.	AUTONOMOUS PLATFORM for DATA ACQUISITION and MAPPING of tree parameters
Griepentrog, H.W.	Evaluating the PORTABILITY of the FROBOMIND ROBOT SOFTWARE architecture to new AUTONOMOUS PLATFORM
Ribeiro, A.	Learning the best SEGMENTATION process for DISCRIMINATING accurately between MONOCOTS and DICOTS
Topakcı, M.	Determination of STUBBLE DENSITY with the IMAGE PROCESSING method by using an autonomous robot
Biscaro, A.S.	Evaluation of a recently developed HAY YIELD MONITOR
Benet, B.	LOCALIZATION and COMMUNICATION for a fleet of VEHICLES to realize with SAFETY AGRICULTURAL tasks
Guerrero, J.M.	A new approach to solve IMAGE THRESHOLDING in precision agriculture

## Poster presentations



### Management, data analyses and decision support systems

Lee, B.W.	MODELS to recommend PANICLE NITROGEN topdressing rate for the target yield and PROTEIN content of RICE
Strothmann, W.	INTERACTIVE IMAGE SEGMENTATION for Model Adaptation and Decision support
Armesto, A.P.	Customized advanced GIS Advisory TOOLS for the SUSTAINABLE management of EXTENSIVE CROPS. Preliminary results



### Precision crop protection

Jensen, P.K.	IMAGE ANALYSIS of dynamic SPRAY distribution to evaluate performance of NOZZLES used for PRECISION WEED CONTROL
Izquierdo, J.	Effect of soil management (no-tillage vs. tillage) on weed spatial distribution in cereals.
Nordmeyer, H.	Use of HERBICIDES based on soil organic matter in a SITE-SPECIFIC WEED CONTROL concept
Llorens, J.	DIGITAL MEASUREMENT and actuators for improving SPRAY APPLICATIONS in tree and vine crops
Bediaf, H.	LEAF SURFACE ROUGHNESS characterization by image processing
Vieri, M.	The RHEA-project ROBOT for TREE CROPS PESTICIDE application



### Advances in precision fructiculture/ viticulture/ oliviculture and horticulture in general

Martínez-Casasnovas, J.A.	Analysis of inter-annual changes of NDVI for precision viticulture applications
Latouche, G.	Early detection of leaf DOWNY MILDEW in vineyards with a new portable FLUORESCENCE SENSOR
Kandylakis, Z.	Evaluating SPECTRAL INDICES from WorldView-2 satellite data for SELECTIVE HARVESTING in VINEYARDS
Oncins, J.A.	An analysis of different sensors and equipment to model and manage viticulture STRATEGIES to achieve HIGH QUALITY WINE
Oncins, J.A.	AUTOMATED IRRIGATION in Vitis vinifera (cv. Tempranillo) depending on SOIL MOISTURE levels



### Advances in precision irrigation

Duran Ros, M.	SCADA system for a PRECISION MICROIRRIGATION network using RECLAIMED EFFLUENT
Torres, A.	EFFIDRIP. An ICT platform for scheduling and supervising IRRIGATION in TREE crops
Sugimoto, T	Study on the estimation of the volume WATER CONTENT in the culture soil under plant cultivation using PROPAGATION VELOCITY of SOUND



### Economics, practical adoption and emerging issues

Fontanilla Puerto, J.M.	Controlled release fertilizer in precision agriculture "MULTICOTECH TECHNOLOGY"
Cirani, C.	ADOPTION of precision agriculture technologies in the SUGARCANE industry in BRAZIL
Agüera-Vega, J.	REMOTE MONITORING of CO2 EMISSION save of NO TILL AND PA, with respect to CONVENTIONAL TILLAGE
Imiolek, M.	The use of mobile robots for education in precision agriculture
Hernández, J.A.	Economic and Environmental Benefits of PRECISION MANURE MANAGEMENT in Minnesota

### Poster awards

As part of the poster session, all attendees will be asked to vote for the three best poster presentations. Voting will be carried out through sealed ballot papers included with the conference documentation. Each attendee will write in the ballot paper the numerical codes corresponding to a maximum of three poster presentations. These numerical codes will be indicated in each panel. The awards will be presented at the conference dinner.





# Field Demo

This 9ECPA we would like to show the attendees some of the latest technological developments in precision agriculture and viticulture. For this reason a Field demo is scheduled for July 10th. It will start at 9:00h and finish at 12:00h before the day gets too hot. The Field demo will take place at the vineyards of the Raimat cellar (Grup Codorníu) located 15 km away from Lleida. We really appreciate the contribution of Grup Codorníu and the company Agropixel hosting us and showing how they are implementing Precision Viticulture. Buses will pick up and take everyone there. Time and place will be conveniently announced. Comfortable clothing is highly recommended. At the end of the field demo, the buses will return the attendees to their hotels to refresh and change clothing and everyone will go to the conference venue on their own for lunch at 13h.

BODEGAS Y VIÑEDOS  
**CODORNÍU RAVENTÓS**  
DESDE 1551

**AGROPIXEL**



## Station 1: PRECISION VITICULTURE

SubStation 1.1	SubStation 1.2	SubStation 1.3
Selective harvesting	Precision fertilization + Precision irrigation	Sensors for Precision Viticulture

AGROPIXEL

RSC

IRTA

Force A

## Station 2: FIELD CROPS & REMOTE SENSING

SubStation 2.1	SubStation 2.2	SubStation 2.3
Swath control	Machine Sync	Remote sensing + UAV

JOHN DEERE

JOHN DEERE

FIELD COPTER

## Station 3: VARIABLE RATE TECHNOLOGIES

SubStation 3.1	SubStation 3.2	SubStation 3.3
Frutteto3 tractor+VMS management system	Canopy characterization + variable rate spray application	Variotronic All-in-one

SAME DEUTZ-FAHR

AGCO

AGCO

9:00-9:10	Group A-1	Group A-2	Group A-3	Group B-1	Group B-2	Group B-3	Group C-1	Group C-2	Group C-3
9:15-9:25	Group A-3	Group A-1	Group A-2	Group B-3	Group B-1	Group B-2	Group C-3	Group C-1	Group C-2
9:30-9:40	Group A-2	Group A-3	Group A-1	Group B-2	Group B-3	Group B-1	Group C-2	Group C-3	Group C-1
10:00-10:10	Group C-1	Group C-2	Group C-3	Group A-1	Group A-2	Group A-3	Group B-1	Group B-2	Group B-3
10:15-10:25	Group C-3	Group C-1	Group C-2	Group A-3	Group A-1	Group A-2	Group B-3	Group B-1	Group B-2
10:30-10:40	Group C-2	Group C-3	Group C-1	Group A-2	Group A-3	Group A-1	Group B-2	Group B-3	Group B-1
11:00-11:10	Group B-1	Group B-2	Group B-3	Group C-1	Group C-2	Group C-3	Group A-1	Group A-2	Group A-3
11:15-11:25	Group B-3	Group B-1	Group B-2	Group C-3	Group C-1	Group C-2	Group A-3	Group A-1	Group A-2
11:30-11:40	Group B-2	Group B-3	Group B-1	Group C-2	Group C-3	Group C-1	Group A-2	Group A-3	Group A-1
12:00	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS	TRANSFER TO HOTELS

**Meeting point for departure to the field demo: CCCT building (conference venue) at 8h**

\*The language of the demo will be English, as it is in the Conference. However, one of the groups will put together local stakeholders only attending the field demonstration. There will be a translator accompanying them along the demo.

Field Demo

# Partner Program&Evening events

	Sunday 7/7/2013	Monday 7/8/2013	Tuesday 7/9/2013	Wednesday 7/10/2013	Thursday 7/11/2013		
8:00				<b>Boi Valley UNESCO World Heritage Site (Sant Climent in Taüll, Sant Joan in Boi and Santa Eulàlia in Erill la Vall). 8:00-18:20</b>  The valley is best known for its nine Early Romanesque churches, making it the site of the densest concentration of Romanesque architecture in Europe. It was designated as a World Heritage Site by UNESCO on 30 November 2000. The valley also includes the highest ski resort in the Pyrenees, at Boi-Taüll, and borders the Aigüestortes i Estany de Sant Maurici National Park which lies to the northeast.			
8:30							
9:00							
9:30		<b>Guided City Tour. 09:30-12:00</b>  This tour is a walk down Commercial Street, one of the longest shopping areas in Europe. Along this street, apart from the wide range of shops and services found in this area, is added the existence of a remarkable buildings that are interesting from the point of view of history and art.	<b>The Royal Abbey of Santa Maria de Poblet and Museum and Olive Oil Theme Park. 09:00-17:00</b>  The Royal Abbey of Santa Maria de Poblet is a Cistercian monastery, founded in 1151, located at the feet of the Prades Mountains, in the comarca of Conca de Barberà, in Catalonia.  The main production of what are widely regarded as some of the best olive oils in the world is concentrated in about thirty villages in the comarcas of Les Garrigues (Lleida). Museum and Olive Oil Theme Park is a beautiful oil sample and short of time, culture and economy of a people and an entire region.  Wandering can enter time and share and understand the roots of a land and a people who have always maintained a close relationship of dependence and respect.		<b>Guided visit to Museum of Lleida. 9:30-11:15</b>  Lleida Museum, the shortened and current usual name of the Diocesan and Comarcal Lleida Museum, is an art and history museum in Lleida.		
10:00							
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18:30				<b>Evening Events at the conference venue. 18:20</b>  Visit to 'San Miguel' brewery (limited places)  A stroll through Lleida (limited places)  Attendees can choose one of the two proposals previous registration during the morning.	<b>Closing Ceremony and lunch (Congress venue). 12:00</b>  Attendee's partners are also invited to the Closing Ceremony		
19:00		<b>Evening Events at the conference venue. 19:00</b>  A stroll through Lleida (limited places)  You cook it, you eat it now (20€ )	<b>Evening Events at the conference venue. 19:00</b>  Human towers exhibition 'Els Castellers de Lleida' (open to all attendees)  You cook it, you eat it now (20€)				
19:30	<b>Welcome reception at the Seu Vella (Lleida's old cathedral)</b>						
20:00							
20:30							
21:00							
21:30							
22:00							
22:30							
23:00							
23:30							
00:00							



# Map of Lleida



## Hotels

- |                               |                                       |
|-------------------------------|---------------------------------------|
| 1. Hotel Catalonia Transit*** | 6. Hotel Ibis Lleida**                |
| 2. Hotel NH Pirineos****      | 7. Hotel Ibis Budget**                |
| 3. Hotel Real***              | 8. University students residence hall |
| 4. Hotel AC Lleida****        | 9. Youth hostel 'Sant Anastasi'       |
| 5. Hotel Zenit Lleida****     | 10. Hotel Goya                        |

**Remember that on Monday the registration must be done by 8:00 am at the Conference Venue**

**For more information telephone the Technical Secretariat**

**(+34) 609 619 679**

\*The following is the number to be used for any emergency you may have (police, ambulances, etc):

**112**

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Exclusive agricultural magazine of the conference



## Contributors



Universitat  
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For more information:  
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