10th International Conference on

Precision Agriculture

JULY 18-21, 2010 • Hyatt Regency Tech Center Denver Colorado USA

www.icpaonline.org

Conference Program

Colorado State University

IPNI International Plant Nutrition Institute

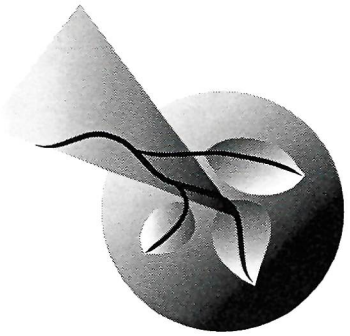
FAR Into the Future — Foundation for Agronomic Research

Conference Chairperson
Dr. Rajiv Khosla, Colorado State University
ICPA@Colostate.edu

Organizing Committee
Dr. Harold Reetz, International Plant Nutrition Institute/ Foundation for Agronomic Research
Dr. Dwayne Westfall, Colorado State University
Mr. Quentin Rund, PAQ Interactive

Conference Coordination
PAQ Interactive

ISPA
International Society of Precision Agriculture
www.internationalsocietyofprecisionagriculture.org



10th International Conference on

Precision Agriculture

JULY 18-21, 2010 • **Hyatt Regency Tech Center Denver Colorado USA**

The 10th International Conference on Precision Agriculture will highlight significant research and its applications in precision agriculture and showcase emerging technologies and information management for agriculture. It will offer oral and poster presentations and exhibits, as well as a discussion and exchange of information in various aspects of precision agriculture. The dedicated sessions on Precision A to Z tracks will offer information on key topics for practitioners, crop consultants, advisors, extension personnel, agronomists, producers and other practitioners.

The 10th ICPA is brought to you by Colorado State University, Foundation for Agronomic Research and International Plant Nutrition Institute.

Colorado State University

IPNI International Plant Nutrition Institute

FAR Into the Future — Foundation for Agronomic Research

ISPA — International Society of Precision Agriculture

Program Committee

Conference Chairperson:

Dr. Rajiv Khosla, Professor of Precision Agriculture
Colorado State University, Fort Collins , CO, USA

Organizing Committee:

Dr. Harold Reetz, Reetz Agronomics, Monticello, IL USA

Dr. Dwayne Westfall, Professor of Soil Fertility
Colorado State University, Fort Collins, CO, USA

Mr. Quentin Rund, PAQ Interactive

A to Z Track Chair:

Dr. Steve Phillips, Director, Southeast United States
International Plant Nutrition Institute, Owens Cross Roads, AL, USA

Theme Session Chairs:

Precision Conservation:

Dr. Tom Mueller, Associate Professor
Plant and Soil Sciences Department,
University of Kentucky Lexington, KY, USA

Dr. Jorge A. Delgado, Soil Scientist
Soil Plant Nutrient Research Unit
USDA, Agricultural Research Service, Fort Collins, CO, USA

Precision Carbon Management:

Dr. David Clay, Director
Drought Center, SDSU, Brookings, SD, USA

Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crop:

Dr. Nicolas Tremblay, Research Scientist
Agriculture and Agri-Food Canada
St-Jean-sur-Richelieu, Quebec, Canada

eXtension: Precision Agriculture on the Internet:

Dr. John Nowatzki, Extension Specialist
Dept. of Agricultural and Biosystems Engineering
North Dakota State University, Fargo, ND, USA

Optimizing Farm-level use of Spatial Technologies:

Dr. Terry Griffin, Assistant Professor – Extension Economist
Cooperative Extension Service Departments, Agricultural Economics and Agribusiness,
University of Arkansas, Little Rock, AR, USA

Precision Livestock Management:

Dr. David Lamb, Group Leader
Precision Agriculture Research Group
University of New England Armidale, NSW, Australia

Education and Training in Precision Agriculture:

Dr. Michael Cox, Professor
Department of Plant and Soil Sciences
Mississippi State Univeristy, Mississippi State, MS, USA

Award Committee Chairs:

Dr. Francis J. Pierce, (Senior Scientist Awards)
Professor, Departments of Crop and Soil Sciences and Biological
Systems Engineering, Washington State University, Pullman, WA, USA

Dr. Viacheslav I. Adamchuk, (Junior Scientist Awards)
Associate Professor, Bioresource Engineering Department,
McGill University, Montreal, Quebec, Canada

Dr. Dwayne Westfall, (Graduate Student Awards)
Professor
Colorado State University, Fort Collins, CO, USA

Award Committee Members:

Dr. Margaret A. Oliver, The University of Reading, Reading, United Kingdom
Dr. Thanh Dao, USDA Soil Scientist, Beltsville, MD, USA
Dr. David Mulla, University of Minnesota, St. Paul, MN, USA
Dr. David Bonfil, Gilat Research Center, M.P. Negev, Israel
Dr. Uriel Rosa, University of California-Davis, Davis, CA, USA
Dr. Nicolas Tremblay, Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, Quebec, Canada

Table of Contents

GENERAL

Purpose 1
Program Committee 2
Hotel Floor Plans 4
Exhibitor List 5
Program Overview 6
Opening Plenary Session 10
Oral Presentations 12
A-Z Presentations 29
Poster Sessions 31

PROGRAM: MONDAY, JULY 19, 2010

Concurrent Sessions – Morning

Precision Nutrient Management - I 12
Canopy Sensing for Crop Management 12
Engineering Technologies and Advances in Precision Agriculture - I 13
Education and Training in Precision Agriculture 13

Concurrent Sessions – Afternoon

Remote Sensing Applications in PA - I 14
Guidance and GPS Systems in Precision Ag 14
eXtension: Precision Agriculture on the Internet 15
Modeling and Geo-Statistics - I 15

Concurrent Sessions – Late Afternoon

Site-Specific Management Zones 16
Hyperspectral Applications in Precision Agriculture 16
Information Management and Traceability 17
Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crops - I 17

Precision A to Z for Practitioners

A to Z: Precision A to Z for Practitioners - I 29
A to Z: Precision A to Z for Practitioners - II 29
A to Z: Precision A to Z for Practitioners - III 29
Poster Sessions 31

PROGRAM: TUESDAY, JULY 20, 2010

Concurrent Sessions – Morning

Sensor Application in Managing In-Season Crop Variability 18
Precision Carbon Management - I 18
Precision Conservation - I 19
Precision Horticulture 19

Concurrent Sessions – Mid-morning

Precision Nutrient Management - II 20
Spatial Variability in Soil and Crops - I 20
Precision Conservation - II 21
Precision Crop Protection in Cotton 21

Concurrent Sessions – Afternoon

Remote Sensing Applications in PA - II 22
Precision Carbon Management - II 22
Engineering Technologies and Advances in Precision Agriculture - II 23
Profitability and Adoption in Precision Agriculture 23

Concurrent Sessions – Late Afternoon

Precision Nutrient Management - III 24
Spatial Variability in Soil and Crops - II 24
Optimizing Farm-level Use of Spatial Technologies 25
Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crops - II 25

Precision A to Z for Practitioners

A to Z: Precision A to Z for Practitioners - IV 30
A to Z: Precision A to Z for Practitioners - V 30
A to Z: Precision A to Z for Practitioners - VI 30
Poster Sessions 34

PROGRAM: WEDNESDAY, JULY 21, 2010

Concurrent Sessions – Morning

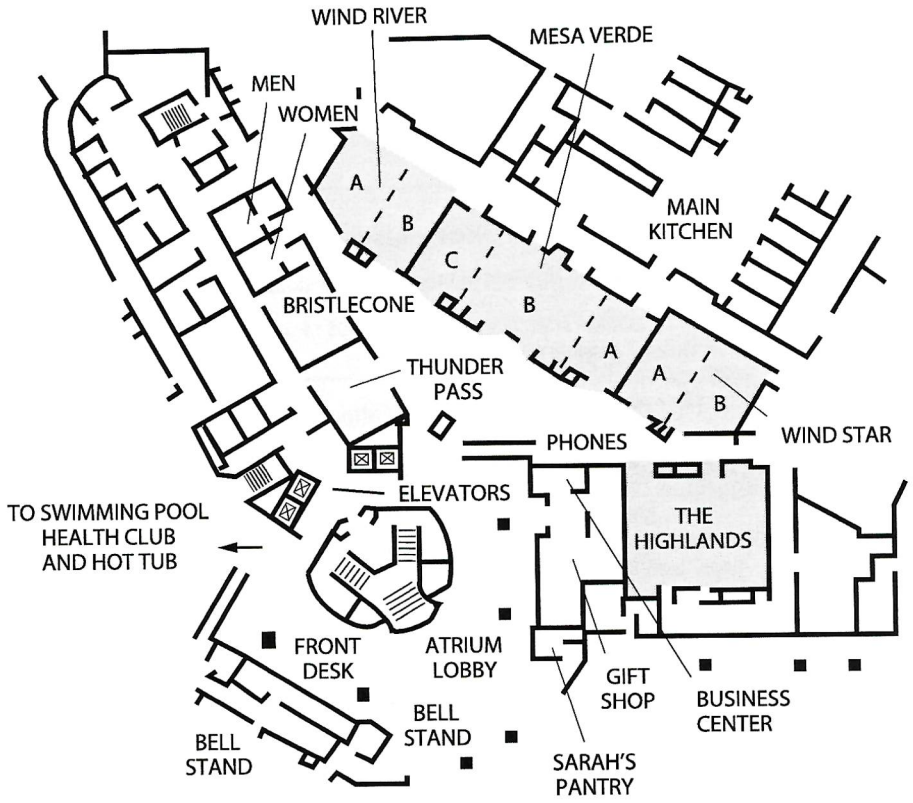
Remote Sensing Applications in PA - III 26
Precision Livestock Management 26
Global Proliferation of Precision Agriculture and its Applications 27
Modeling and Geo-Statistics - II 27
Spatial Variability in Soil and Crops - III 28

Concurrent Sessions – Mid-morning

ISPA Business Meeting 28
Closing Remarks 28

Hotel Floor Plans

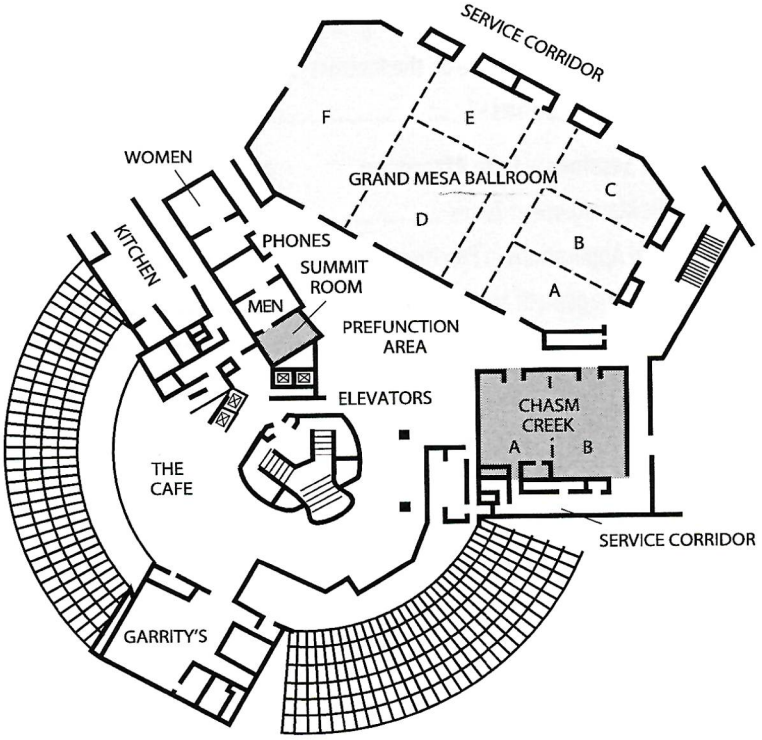
GROUND FLOOR



HYATT™

Hyatt Regency Tech Center
Denver, CO
USA

SECOND FLOOR



Exhibitor List

Adcon International Inc.
2350 Lyndell Terrace, Suite 120
Davis, CA 95616
(530) 753-1054
www.adcon.com

AgJunction/GVM Inc.
374 Heidlersburg Rd, PO Box 358
Biglerville, PA 17307
(717) 677-6197
www.agjunction.com

Agri ImaGIS Technologies
1120 28th Ave. N, Suite C
Fargo, ND 58102
(701) 364-1894
www.satshot.com

Agrian Inc.
2665 N. Air Fresno Dr., Suite 101
Fresno, CA 93727
(559) 437-5700
www.agrian.com

Alabama Precision Agriculture Team (Auburn Univ/AL Coop Extenstion)
200 Corley Bldg
Auburn, AL 36849
(334) 844-3541
www.alabamaprecisionagonline.com

ASD Inc.
2555 55th Street Suite 100
Boulder, CO 80301
(303) 444-6522
www.asdi.com

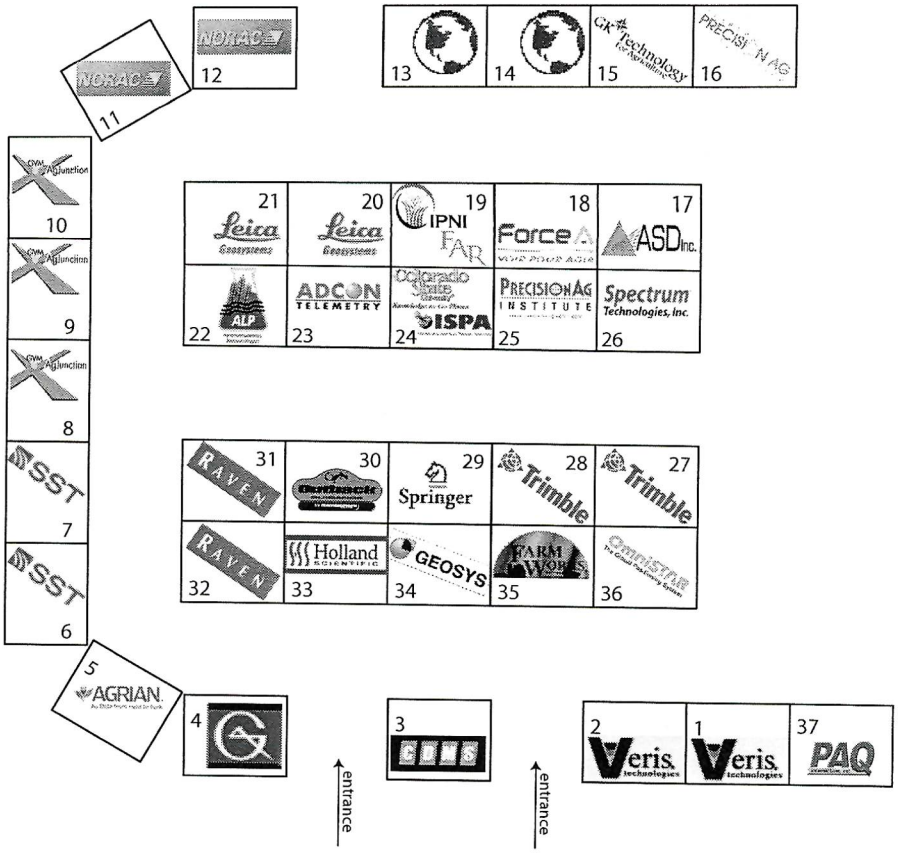
Colorado State University
Department of Soil and Crop Sciences
Ft. Collins, CO 80523
(970) 491-6501
soilcrop.colostate.edu

Crop Data Management Systems
423 Fourth St.
Marysville, CA 45901
(530) 749-7208
www.cdms.net

CTS Agricultural Laboratory Program (ALP)
PO Box 650820
Sterling, VA 20165
(571) 434-1925
www.collaborativetesting.com

FAR/IPNI
3500 Parkway Lane, Suite 550
Norcross, GA 30092
(770) 447-0335
www.ipni.net

Farmworks
9290 Bond St., Suite 102
Overland Park, KS 66214
(913) 495-2700
www.farmworks.com



Force-A
Centre Universitaire Paris SUD,
Batiment 503
Orsay, France 91893
-69358715
www.force-a.com

Geonics
1745 Meyerside Drive
Mississauga, ON Canada L5T 1C6
(905) 670-9580
www.geonics.com

Geosys Inc.
3030 Harbor Lane #202
Plymouth, MN 55447
(612) 839-0359
www.fieldinsite.farmsat.com

GK Technologies Inc.
204 5th St. E
Halstad, MN 56548
(218) 456-2486
www.geektechforag.com

Holland Scientific Inc.
6001 So 58th St, Suite D
Lincoln, NE 68516
(402) 488-1226
www.hollandscientific.com

Leica Geosystems, Inc.
61 Iverness Dr E #200
Englewood, CO 80112
(303) 799-9453
www.agguidance.com

Norac, Inc.
1290 Osborne Rd. NE
Fridley, MN 55432
(763) 786-3060
www.norac.ca

OmniSTAR, Inc.
8200 Westglen Dr.
Houston, TX 77063
(713) 785-5164
www.omnistar.com

Outback/Hemisphere GPS
2207 Iowa St.
Hiawatha, KS 66434
(402) 984-8234
www.outbackguidance.com

PAQ Interactive
107 S. State St.
Monticello, IL 61856
(217) 762-7955
www.paqinteractive.com

PrecisionAg Institute
37733 Euclid Ave
Willoughby, OH 44094
(440) 942-2000
www.precisionagworks.com

Raven Industries
205 E. 6th St.
Sioux Falls, SD 57104
(800) 243-5435
www.ravenprecision.com

Spectrum Technologies
12360 S. Industrial Dr. E.
Plainfield, IL 60585
(815) 436-4440
www.specmeters.com

Springer
Van Godewijckstraat
Dordrecht, The Netherlands
(+31) 7865 76 245
www.springer.com

SST Development Group
824 N. Country Club Rd.
Stillwater, OK 74075
(405) 377-5334
www.sstsoftware.com

Trimble
9290 Bond St., Suite 102
Overland Park, KS 74075
(913) 495-2700
www.trimble.com

Veris Technologies
601 N. Broadway
Salina, KS 67401
(785) 825-1978
www.veristech.com

Program Overview

Sunday, July 18

11:00 am-7:00 pm — **Registration**
2nd Floor Prefunction Area

5:30 pm-7:00 pm — **Reception and Cash Bar**
Centennial Room (12th floor)

6:00 pm-11:00 pm — **Exhibit Hall Setup**
Grand Mesa DEF

Monday, July 19

7:00 am-5:00 pm — Registration Open
2nd Floor Prefunction Area

9:50 am-6:30 pm — Exhibit Hall Open
Grand Mesa DEF

8:00 am-9:50 am — **Opening Session**
Grand Mesa ABC

9:50 am-10:20 am — Break, Exhibit Hall
Grand Mesa DEF

10:20 am-12:00 pm — **Concurrent Sessions**

Precision Nutrient Management - I
Chasm Creek AB

Canopy Sensing for Crop Management
Mesa Verde ABC

Engineering Technologies and Advances in Precision Agriculture - I
Wind River AB

Education and Training in Precision Agriculture
Wind Star AB

10:20 am-12:00 pm — **Precision A to Z for Practitioners**

Precision A to Z - I
The Highlands

12:00 pm-1:30 pm — **Luncheon**
Grand Mesa ABC

1:30 pm-3:30 pm — **Concurrent Sessions**

Remote Sensing Applications in PA - I
Chasm Creek AB

Guidance and GPS Systems in Precision Ag
Mesa Verde ABC

eXtension: Precision Agriculture on the Internet
Wind River AB

Modeling and Geo-Statistics - I
Wind Star AB

1:30 pm-3:30 pm — **Precision A to Z for Practitioners**

Precision A to Z - II
The Highlands

3:30 pm-4:00 pm — **Break, Exhibit Hall**
Grand Mesa DEF

4:00 pm-5:00 pm — **Concurrent Sessions**

Site-Specific Management Zones
Chasm Creek AB

Hyperspectral Applications in Precision Agriculture
Mesa Verde ABC

Information Management and Traceability
Wind River AB

Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crops - I
Wind Star AB

4:00 pm-5:00 pm — **Precision A to Z for Practitioners**

Precision A to Z - III
The Highlands

5:00 pm-6:30 pm — **Poster Session and Cash Bar**
2nd Floor Atrium, Grand Mesa DEF

Tuesday, July 20

7:00 am-5:00 pm — **Registration Open**
2nd Floor Prefunction Area

8:00 am-6:30 pm — **Exhibit Hall Open**
Grand Mesa DEF

8:00 am-10:00 am — **Concurrent Sessions**

Sensor Application in Managing In-Season Crop Variability
Chasm Creek AB

Precision Carbon Management - I
Mesa Verde ABC

Precision Conservation - I
Wind River AB

Precision Horticulture
Wind Star AB

8:00 am-10:00 am — **Precision A to Z for Practitioners**

Precision A to Z - IV
The Highlands

10:00 am-10:30 am — **Break, Exhibit Hall**
Grand Mesa DEF

10:30 am-11:30 am — **Concurrent Sessions**

Precision Nutrient Management - II
Chasm Creek AB

Spatial Variability in Soil and Crops - I
Mesa Verde ABC

Precision Conservation - II
Wind River AB

Precision Crop Protection in Cotton
Wind Star AB

10:30 am-11:30 am — **Practitioner A to Z Track**

Precision A to Z - V
The Highlands

11:30 pm-1:30 pm — **Luncheon, Awards and Entertainment**
Grand Mesa ABC

1:30 pm-3:30 pm — **Concurrent Sessions**

Remote Sensing Applications in PA - II
Chasm Creek AB

Precision Carbon Management - II
Mesa Verde ABC

Engineering Technologies and Advances in Precision Agriculture - II
Wind River AB

Profitability and Adoption in Precision Agriculture
Wind Star AB

1:30 pm-3:30 pm — **Precision A to Z for Practitioners**

Precision A to Z - VI
The Highlands

3:30 pm-4:00 pm — Break, Exhibit Hall
Grand Mesa DEF

4:00 pm-5:00 pm — **Concurrent Sessions**

Precision Nutrient Management - III
Chasm Creek AB

Spatial Variability in Soil and Crops - II
Mesa Verde ABC

Optimizing Farm-level Use of Spatial Technologies
Wind River AB

Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crops - II
Wind Star AB

5:00 pm-6:30 pm — **Poster Session and Cash Bar**
2nd Floor Atrium, Grand Mesa DEF

Wednesday, July 21

7:00 am-10:30 am	Registration Open *2nd Floor Prefunction Area*
8:00 am-10:30 am	Exhibit Hall Open *Grand Mesa DEF*
8:00 am-10:00 am	**Concurrent Sessions**
	Remote Sensing Applications in PA - III *Chasm Creek AB*
	Precision Livestock Management *Mesa Verde ABC*
	Global Proliferation of Precision Agriculture and it's Applications *Wind River AB*
	Modeling and Geo-Statistics - II *Wind Star AB*
	Spatial Variability in Soil and Crops - III *The Highlands*
10:00 am-10:30 am	Break, Exhibit Hall *Grand Mesa DEF*
10:30 am-11:30 am	**International Society of Precision Agriculture** **ISPA Business Meeting** *Grand Mesa ABC*
11:30 am-12:00 pm	**Closing Remarks** *Grand Mesa ABC*

Opening Plenary Session

Monday, July 19, 2010, 8:00 am

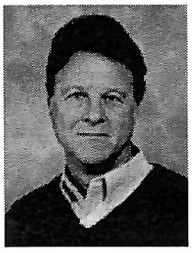
GRAND MESA ABC

Introductory Remarks: Dr. Harold Reetz, Jr.

Session Chair: Dr. Rajiv Khosla

Keynote Speakers

Dr. Ken Cassman



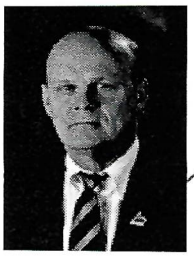
Dr. Cassman is the Director of the Nebraska Center for Energy Sciences Research at the University of Nebraska, and the Heuermann Professor of Agronomy. In previous positions, Dr. Cassman was a research agronomist in Brazil, Egypt and the Philippines, and a faculty member at the Unversity of California—Davis. His research and teaching have focused on ensuring local and global food security while conserving natural resources and protecting environmental quality. Current research efforts investigate: (1) crop yield potential and yield gap analysis at regional, national, and global levels, (2) crop water productivity in water-limited, irrigated agriculture, and (3) environmental impact of the biofuel production life cycle. Dr. Cassman received a PhD (1979) from the University of Hawaii's College of Tropical Agriculture, and a BS degree in Biology from the University of California, San Diego (1975). His publications on yield potential, nitrogen use efficiency, and ecological intensification of agriculture are widely cited in the scientific literature. He is a Fellow of the American Association for the Advancement of Science, the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America, and his work has been recognized by a number of national and international awards.

Presentation Description

Global Food Security, Yield Limits, Precision Agriculture, Conservation of Natural Resources and Environmental Quality

Food production must increase 70% to meet demand from population increase and rising incomes by 2050 when human population will reach 9.2 billion. Even without climate change, the current trajectory in crop yields will meet projected demand without an enormous expansion of cropped area at expense of remaining rain forest, wetlands, and grassland savannahs. A rapid acceleration in rate of yield gain is needed to avoid conversion of these C-rich and biodiverse ecosystems to agriculture. But while increases in rate of yield gain are necessary, they are not sufficient to also ensure protection of environmental quality. Instead, a process of increasing yields while also reducing the environmental footprint of crop production is required—called "ecological intensification" (EI). Achieving EI on the world's most productive farm land represents the single greatest scientific challenge facing humankind for two reasons. First, average farm yields are approaching biophysical yield limits, which causes yields to plateau. In fact, yield plateaus are already evident for rice in China, Japan and Korea, and for wheat in northwest Europe, and perhaps for irrigated maize in the USA. Second, crop response to applied nutrients typically follow a diminishing return function such that use-efficiency falls of markedly as yields approach the yield potential ceiling. Hence, precision agriculture is the key to achieving EI in high-yield systems such that input rates are carefully matched to crop demand in time and space. While agricultural equipment and electronic controls, remote sensing, portable computing power, and software are up to the task, robust knowledge of crop response to soil conditions and weather is lacking. Improving our ability to predict crop response in "real-time" during the growing season with user-friendly crop models and decision-support tools is the key to achieving EI at yields that approach the genetic yield ceiling of our major crops.

Dr. William Raun



Dr. William (Bill) Raun is a Regents Professor in the Department of Plant and Soil Sciences at Oklahoma State University (OSU) and was awarded the Nutrients for Life Distinguished Professorship in 2009. Dr. Raun received his B.S. and M.S. degrees from OSU and a Ph.D. from the University of Nebraska. Before joining OSU in 1991 Dr. Raun was the Maize Staff Agronomist at CIMMYT based in Guatemala City, Guatemala. While at OSU Dr. Raun and his team have been pioneers in the development of active remote N sensor technology. His sensor research has focused on sensor development, in-season yield prediction using sensors, and development of in-season sensor based N fertilizer algorithms to increase N use efficiency. Dr Raun's research also has an international perspective that has taken him to many countries around the world where he has developed projects to pioneer active remote N sensing research. He teaches soil and plant nutrition and precision agriculture courses. He is the author of over 150 scientific papers and has advised over 50 graduate students from around the world. He is a Fellow of the American Society of Agronomy and the Soil Science Society of America. Other recognitions include the Melvin D. and Mary E. Jones Distinguished Professor, Sarkelys Distinguished Professor, Werner Nelson and Robert E. Wagner awards.

Presentation Description

Application of Indirect Measures for Improved Nitrogen Fertilization Algorithms

Over the past thirty years, sensing technologies in agriculture have rapidly moved from less complicated passive sensors to active ones that provide their own light source, thus allowing for instantaneous calibration regardless of time of day or ambient conditions. Early sensing technologies available in research included instruments developed by Li-Cor Inc., Lincoln, NE for measuring carbon dioxide, illumination sensors for determining plant N status, and shortwave radiation. Affordable spectrometers like those sold by Ocean Optics Inc. (Duneden, FL) capable of collecting raw radiance values for wavelengths 300-1100 nm were and still are commonly used in the field. From spectrometer data, the development of indices capable of detecting nitrogen (N) and water status ensued. The most common index has been the normalized difference vegetative index or NDVI which was found to be an excellent predictor of forage biomass, forage N uptake, and final grain yield when combined with climatic data. The development of active sensors capable of collecting NDVI readings day or night has most recently been advanced to highly affordable pocket sensors. Combined this technology has been expanded into complex algorithms that predict fertilizer N needs from mid-season sensor and climatological data. Today, on-the-go sensor based N management in cereals is commercially used to maximize farmer profits and minimize environmental risk via the judicious application of N fertilizers.

Oral Presentations

Monday, July 19, Morning

Precision Nutrient Management I
CHASM CREEK AB

Moderator: Dr. David Bonfill, Institute of Plant Science

10:20 **Comparative Analysis Of Different Approaches**
A. Melnitchouck, G. Donald, and T. Schmaltz

10:40 **Quantifying Spatial Variability Of Indigenous Nitrogen Supply For Precision Nitrogen Management In North China Plain**
Y. Miao, Q. Cao, Z. Cui, X. Chen, F. Li, T. H. Dao, and R. Khosla

11:00 **Matching Nitrogen To Plant Available Water For Malting Barley On Highly Constrained Vertosol Soil**
B. Sauer, C. Guppy, M. Trotter, D. Lamb

11:20 **Spatial And Vertical Distribution Of Soil P, K, And Mg Content In A Vineyard Of The Do Ca Rioja Using Grid And Target Sampling Methods**
O. Unamunzaga, A. Castellón, G. Besga, R. Perez-Parmo, A. Aizpurua, P. Gallejones, and A. Usón

11:40 **Spatial Variability Of Crop And Soil Properties In A Crop-livestock Integrated System**
A.C.C. Bernardi, C.R. Grego, R.G. Andrade, C.M.P. Vaz, L.M. Rabello, and R.Y. Inamasu

Canopy Sensing for Crop Management
MESA VERDE ABC

Moderator: Dr. Thanh Dao, USDA-ARS, Beltsville

10:20 **Is A Nitrogen-rich Reference Needed For Canopy Sensor-based Corn Nitrogen Applications?**
N.R. Kitchen, K.A. Sudduth, and S.T. Drummond

10:40 **Using An Active Crop Sensor To Detect Variability Of Nitrogen Supply On Sugar Cane Fields**
J.P. Molin, G. Portz, and J. Jasper

11:00 **Comparison Of Three Canopy Reflectance Sensors For Variable-rate Nitrogen Application In Corn**
K.A. Sudduth, N.R. Kitchen, and S.T. Drummond

11:20 **Comparison Of Spectral Indices Derived From Active Crop Canopy Sensors For Assessing Nitrogen And Water Status**
L.S. Shiratsuchi, R.B. Ferguson, J.F. Shanahan, V.I. Adamchuk, and G.P. Slater

11:40 **Using Multiplex® And GreenseekerTM To Manage Spatial Variation Of Vine Vigor In Champagne**
S. Debuisson, C. Germain, O. Garcia, L. Panigai, D. Moncomble, M. Le Moigne, E.M. Fadaili, S. Evain, and Z.G. Cerovic

12:00 - 1:30 Luncheon
GRAND MESA ABC

Monday, July 19, Morning

Engineering Technologies and Advances in Precision Agriculture - I
WIND RIVER AB

Moderator: Dr. Shrini Upadhyaya, University of California Davis

10:20 **Tools For Evaluating The Potential Of Automatic Section Control**
T.S. Stombaugh, R.S. Zandonadi, J.D. Luck, and S.A. Shearer

10:40 **Application Rate Stability When Implementing Automatic Section Control Technology On Agricultural Sprayers**
A. Sharda, J.P. Fulton, T.P. McDonald, J.D. Luck, and S.A. Shearer

11:00 **On-the-go Condition Mapping For Harvesting Machinery**
T. Coen, J. De Baerdemaeker, and W. Saeys

11:20 **New Power-leds Based Illumination System For Fertilizer Granule Motion Estimation**
B. Hijazi, F. Cointault, J. Dubois, J. Vangeyte, and M. Paindavoine

11:40 **Optical Based Sugarcane Yield Monitors**
R.R. Price, R.M. Johnson, and R.P. Viator

Education and Training in Precision Agriculture
WIND STAR AB

Theme Chair: Dr. Michael Cox, Mississippi State University

10:20 **Developing And Teaching A Site-specific Crop/soil Management Course**
M.S. Cox, and D.F. Roberts

10:40 **Precision Agriculture Education Program In Nebraska**
V.I. Adamchuk, and R.B. Ferguson

11:00 **Experiences Of Extension Education Via Online Delivery Of Programming Related To Precision Agriculture Technologies**
D.K. Shannon

11:20 **Isobus Demonstrator And Working Environment For Agricultural Engineering Education**
D. Bosse, T. Kinder, A. Ruckelshausen, T. Dzinaj, and R. Klose

11:40 **Revisited: A Case Study Approach For Teaching And Applying Precision Agriculture**
J.D. Williams, and S.D. McGary

12:00 - 1:30 Luncheon
GRAND MESA ABC

Monday, July 19, Afternoon

Remote Sensing Applications in PA - I
CHASM CREEK AB

Moderator: Dr. Yuxin Miao, China Agricultural University

1:30 **Weeds Detection By Ground-level Hyperspectral Imaging**
U. Shapira, I. Herrmann, A. Karnieli, and .J. Bonfil

1:50 **Comparison Of Different Vegetation Indices And Their Suitability To Describe N-uptake In Winter Wheat For Precision Farming**
M. Strenner, and F.-X. Maidl

2:10 **Nitrogen And Water Stress Impacts Hard Red Spring Wheat (Triticum Aestivum) Canopy Reflectance**
C.L. Reese, D.E. Clay, S.A. Clay, D.L. Beck, and D.S. Long

2:30 **Determination Of Crop Injury From Aerial Application Of Glyphosate Using Vegetation Indices And Geostatistics**
B.V. Ortiz, S.J. Thomson, Y. Huang, K. Reddy, W. Ding, and H. Stone

2:50 **Near Real-time Meter-resolution Airborne Imagery For Precision Agriculture: Aerocam**
X. Zhang, C. Streeter, H. Kim, and D. Olsen

3:10 **Discussion**

Guidance and GPS Systems in Precision Ag
MESA VERDE ABC

Moderator: Dr. Jose Molin, University of Sao Paulo

1:30 **Profitability Of RTK Autoguidance And Its Influence On Peanut Production**
K. Balkcom, B.V. Ortiz, W. Goodman, and J.P. Fulton

1:50 **Using GPS-RTK In Crop Variety And Hybrid Evaluations**
R.N. Klein, and J.A. Golus

2:10 **GPS Guidance Of Mechanized Site Preparation In Forestry Plantations: A Precision Forestry Approach**
S.C. Husband

2:30 **The Cost Of Dependence Upon GPS-enabled Navigation Technologies**
T.W. Griffin

2:50 **Discussion**

3:30 - 4:00 Break in Exhibit Hall
GRAND MESA DEF

Monday, July 19, Afternoon

eXtension: Precision Agriculture on the Internet
WIND RIVER AB

Theme Chair: Dr. Jon Nowatzki, North Dakota State University

1:30 **Extension: Precision Ariculture On The Internet**
J.F. Nowatzki

1:50 **Not Possible In Real Life: Precision Agriculture's Future In 3D Virtual Worlds**
L.S. Phillips

2:10 **The Scholarship Of eXtension**
M. Lambur

2:30 **We Want You: Contributing Your Expertise To A Community Of Practice (COP)**
A.E. Hays

2:50 **Interpretation Of Thinking Process In Farmer's Decision**
S. Shibusawa

3:10 **Discussion**

Modeling and Geo-Statistics - I
WIND STAR AB

Moderator: Dr. Slava Adamchuck, McGill University

1:30 **Saltmed Model As An Integrated Management Tool For Precision Management Of Water, Crop, Soil, And Fertilizers**
R. Ragab

1:50 **Analysis Of Water Use Efficiency Using On-the-go Soil Sensing And A Wireless Network**
L. Pan, V.I. Adamchuk, D.L. Martin, M.A. Schroeder, and R.B. Ferguson

2:10 **Assessment Of Climate Variability On Optimal Nitrogen Fertilizer Rates For Precision Agriculture**
B. Basso, D. Cammarano, G. Cafiero, L. Sartori, and F. Basso

2:30 **Early Identification Of Leaf Rust On Wheat Leaves With Robust Fitting Of Hyperspectral Signatures**
C. Römer, T. Rumpf, L. Plümer, K. Bürling, M. Hunsche, and G. Noga

2:50 **Decision Making And Operational Planning**
T. Oksanen, A. Aspiala, and A. Visala

3:10 **Discussion**

3:30 - 4:00 Break in Exhibit Hall
GRAND MESA DEF

Monday, July 19, Late Afternoon

Site-Specific Management Zones
CHASM CREEK AB

Moderator: Dr. Rodrigo Ortega, University of Federico Santa María

4:00 **New Geospatial Technologies For Precision Farming**
K. Charvat, Z. Krivanek, K. Charvat jr., P. Bruns, J. Cepicky, S. Kafka, and P. Gnip

4:20 **A Clustering Approach For Management Zone Delineation In Precision Agriculture**
G. Ruß, R. Kruse, and M. Schneider

4:40 **Spatial-temporal Management Zones For Biomass Moisture**
S. Fountas, D.D. Bochtis, C.G. Sørensen, O. Green, T. Bartzanas, and R.N. Jøgersen

Hyperspectral Applications in Precision Agriculture
MESA VERDE ABC

Moderator: Dr. Yubin Lan, USDA-ARS

4:00 **Hyperspectral Imaging Of Sugar Beet Symptoms Caused By Soil-borne Organisms**
C. Hillnhütter, A.-K. Mahlein, R.A. Sikora, and E.-C. Oerke

4:20 **Multi, Super Or Hyper Spectral Data, The Right Way From Research Toward Application In Agriculture**
D.J. Bonfil, I. Herrmann, A. Karnieli, and A. Pimstein

4:40 **Use Of Spectral Distance, Spectral Angle, And Plant Abundance Derived From Hyperspectral Imagery To Characterize Crop Growth Variation**
C. Yang

5:00 - 6:30 Poster Session and Cash Bar
2nd Floor, The Atrium, Grand Mesa DEF

Monday, July 19, Late Afternoon

Information Management and Traceability
WIND RIVER AB

Moderator: Amy Winstead, Auburn University

4:00 **Integrated Land Management – ICT Solutions & Business Models**
W.H. Mayer

4:20 **Analysis Of Principles For Adaptive Knowledge Management On Pilot Farms**
M. Gemtou, P. Gnip, and K. Charvat

4:40 **Traceability And Management Information System Of Agricultural Product Quality Safety In China**
Y. Xinting, L. Ming, S. Chuanheng, Q. Jianping, and J. Zengtao

Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crops - I
WIND STAR AB

Theme Chair: Dr. Nicolas Tremblay, Agriculture and Agri-Food Canada

4:00 **Interest Of 3D Modeling For Lai Retrieval From Canopy Transmittance Measurements: The Cases Of Wheat And Vineyard**
B. de Solan, R. Lopez-Lozano, K. Ma, F. Baret, and B. Tisseyre

4:20 **SPOT5 Multispectral Data Potentialities To Monitor Potato Crop Nitrogen Status At Specific Field Scale**
J.P. Goffart, L. Van Den Wyngaert, D. Buffet, A. Leonard, and P. Defourny

4:40 **A Comparison Of Spectral Reflectance And Laser-induced Cholorphyll Fluorescence Measurements To Detect Differences In Aerial Dry Weight And Nitrogen Update Of Wheat**
B. Mistele, and U. Schmidhalter

5:00 - 6:30 Poster Session and Cash Bar
2nd Floor, The Atrium, Grand Mesa DEF

Tuesday, July 20, Morning

Sensor Application in Managing In-Season Crop Variability
CHASM CREEK AB

Moderator: Dr. Newell Kitchen, USDA-ARS

8:00 **Primary Framework Of Diagnosis And Management For Wheat Production Based On The Online Telemonitoring Networks**
S. Zhong-fu, D. Ke-ming, Z. Yan, and L. Ju-bao

8:20 **Ultra Low Level Aircraft (ULLA) As A Platform For Active Optical Sensing Of Crop Biomass**
D.W. Lamb, M.G. Trotter, and D.A. Schneider

8:40 **Performance Evaluation Of Off-shelf Range Sensors For In-field Crop Height Measurement**
Y. Shi, N. Wang, and R.K. Taylor

9:00 **Development Of A Sensor Suite To Determine Plant Water Potential**
V. Udompetaikul, S.K. Upadhyaya, D.C. Slaughter, and B.D. Lampinen

9:20 **Sensor And System Technology For Individual Plant Crop Scouting**
A. Ruckelshausen, L. Busemeyer, R. Klose, A. Linz, K. Moeller, M. Thiel, K. Alheit, F. Rahe, D. Trautz, and U. Weiss

9:40 **Innovative Optical Sensors For Diagnosis, Mapping And Real-time Management Of Row Crops: The Use Of Polyphenolics And Fluorescence**
V. Martinon, E.M. Fadailli, S.Evain, M. Bécu, C, Duval, and J. Fumery

Precision Carbon Management - I
MESA VERDE ABC

Theme Chair: Dr. David Clay, South Dakota State University

8:00 **Soil Organic Carbon Maintenance Requiremnets And Mineralizatyion Rate Constants: Site Specific Calcuations**
D. Clay, G. Carlson, and S. Clay

8:20 **An Overview of Soil Carbon, Management, and Agricultural Systems**
R. Follett

8:40 **Performance Of The Veris Nir Spectrophotometer For Mapping Soil C In The Palouse Soils Of Eastern Washington**
F. Pierce, P. Carter, E. Perry, S. Young, H. Collins

9:00 **Landscape Position And Climatic Gradient Impacts On Carbon Turnover in Dryland Cropping Systems in Colorado**
G.A. Peterson, D.G. Westfall, and L.A. Sherrod

9:20 **Modeling Soil Carbon Spatial Variation: Case Study In The Palouse Region**
A.R. Kemanian, D.R. Huggins, and D.P. Uberuaga

9:40 **Discussion**

10:00 - 10:30 Break in Exhibit Hall
GRAND MESA DEF

Tuesday, July 20, Morning

Precision Conservation - I
WIND RIVER AB

Theme Chair: Dr. Tom Mueller, University of Kentucky

8:00 **Designing Variable-width Filter Strips Using GIS And Terrain Analysis**
M.G. Dosskey, and T.G. Mueller

8:20 **Precision Management For Enhancing Farmer Net Returns With The Conservation Reserve Program**
C.R. Dillon, and J. Shockley

8:40 **Extending The Concept Of Precision Conservation To Restoration Of Rivers And Streams**
M. Tomer, D. James, J. Bean, A. Simon, D. Klimetz, B. Gelder, and B. Yan

9:00 **Precision Conservation: Using Precision Agriculture Technology To Optimize Conservation And Profitability In Agricultural Landscapes**
M.D. McConnell, L.W. Burger, Jr., and W. Givens

9:20 **Development And Application Of Gully Erosion Components Within The USDA Annagnps Watershed Model For Precision Conservation**
R.L. Bingner, R.R. Wells, H.G. Momm, F.D. Theurer, and L.D. Frees

9:40 **Determining Whole-farm Conservation Solutions For Small Farms In Northeastern United States**
T.L. Veith, and L.T. Ghebremichael

Precision Horticulture
WIND STAR AB

Moderator: Dr. Reza Ehsani, University of Florida

8:00 **Development Of Ground-based Sensor System For Automated Agricultural Vehicle To Detect Diseases In Citrus Plantations**
S. Sankaran, R. Ehsani, and C. Dima

8:20 **Citrus Greening Disease Detection Using Airborne Multispectral And Hyperspectral Imaging**
A. Kumar, W.S. Lee, R. Ehsani, L.G. Albrigo, C. Yang, and R. L. Mangan

8:40 **Fluorescence Imaging Spectroscopy Applied To Citrus Diseases**
C. Wetterich, J. Belasque, Jr., and L.G. Marcassa

9:00 **HLB Detection Using Hyperspectral Radiometry**
J. Gonzalez-Mora, C. Vallespi, C.S. Dima, and R. Ehsani

9:20 **Discussion**

10:00 - 10:30 Break in Exhibit Hall
GRAND MESA DEF

Tuesday, July 20, Mid-morning

Precision Nutrient Management - II
CHASM CREEK AB

Moderator: Dr. Ronnie Heiniger, North Carolina State University

10:30 **Adoption And Perceived Usefulness Of Precision Soil Sampling Information In Cotton Production**
D.C. Harper, D.M. Lambert, R.K. Roberts, B.C. English, M. Velandia, J.A. Larson, D.F. Mooney, S.L. Larkin, and J.M. Reeves

10:50 **Evaluation Of A Controlled Release N-P Fertilizer Using A Modified Drill For Variable Rate Fertilization**
R.A. Ortega, J.F. Reyes, W. Esquivel, and J. Orellana

11:10 **Assessment Of Pod Ceal Dc™ Effect On Grain Yield In Beans Using Multi-spectral Satellite Imagery And Yield Data**
A. Melnitchouck, and G. Donald

Spatial Variability in Soil and Crops - I
MESA VERDE ABC

Moderator: Dr. John Grove, University of Kentucky

10:30 **A Comparison Of Conventional And Sensor-based Lime Requirement Maps**
A.K. Jonjak, V.I. Adamchuk, C.S. Wortmann, R.B. Ferguson, and C.A. Shapiro

10:50 **Spatial Mapping Of Penetrometer Resistance On Turfgrass Soils For Site-specific Cultivation**
I. Flitcroft, J. Krum, K. Rice, T. Carson, V. Cline, R. Carrow, K. Rice, T. Carson, and V. Cline

11:10 **Spatial Variability Analyse And Correlation Between Physical Chemical Soil Attributes And Sugarcane Quality Parameters**
F.A. Rodrigues, Jr., P.S.G. Magalhães, and D.G.P. Cerri

11:30 - 1:30 Luncheon, Awards Entertainment
GRAND MESA ABC

Tuesday, July 20, Mid-morning

Precision Conservation - II
WIND RIVER AB

Theme Chair: Dr. Tom Mueller, University of Kentucky

10:30 **A Comparison Of Alternative Methods For Prioritizing Buffer Placement In Agricultural Watersheds For Water Quality Improvement**
M.G. Dosskey, and Z. Qiu

10:50 **Precision Conservation: Site-specific Trade-offs Of Harvesting Wheat Residues For Biofuel Feedstocks**
D.R. Huggins, and C. Kruger

11:10 **Discussion**

Precision Crop Protection in Cotton
WIND STAR AB

Moderator: Dr. Brenda Ortiz, Auburn University

10:30 **Mepiquat Chloride Application On Cotton At Variable Rate**
P.S.G. Magalhães, L.R. Queiros, and C.D. Gadanha

10:50 **Development Of A System For Site-specific Nematicide Placement In Cotton**
A. Khalilian, J.D. Mueller, W.G. Henderson, S. Monfort, T.L. Kirkpatrick, and C. Overstreet

11:10 **Variable Rate Application Of Nematicides On Cotton Fields: A Promising Site-specific Management Strategy**
B.V. Ortiz, C. Perry, D. Sullivan, R. Kemerait, P. Lu, R. Davis, and A. Smith

11:30 - 1:30 Luncheon, Awards and Entertainment
GRAND MESA ABC

Tuesday, July 20, Afternoon

Remote Sensing Applications in PA - II
CHASM CREEK AB

Moderator: Dr. Fran Pierce, Washington State University

1:30 **A Step Towards Precision Irrigation: Plant Water Status Detection With Infrared Thermography**
S. Zia, W. Spreer, J. Müller, K. Spohrer, W. Du, and H. Xiongkui

1:50 **Using A Surface Energy Model (reset) To Determine The Spatial Variability Of ET Within And Between Agricultural Fields**
A. Elhaddad, L. A. Garcia

2:10 ***Remote Estimation Of Gross Primary Production In Maize***
Y. Peng, A.A. Gitelson, G. Keydan, D.C. Rundquist, B, Leavitt, S.B. Verma, and A.E. Suyker

2:30 **Low Cost High-resolution Aerial Photogrammetric Techniques For Precision Agriculture In Latin American Countries**
J.S. Perret, O.E. Arriaza, M.E. Dávila, and J.F. Aguilar

2:50 **Sectioning And Assessment Remote Images For Precision Agriculture: The Case Of Orobanche Crenate In Pea Crop**
L. García-Torres, D. Gómez-Candón, J.J. Caballero-Novella, M. Gómez-Casero, J.M. Peña-Barragán, M. Jurado-Expósito, F. López-Granados, I. Castillejo-González, and A. García-Ferrer

3:10 **Timely, Objective, And Accurate Crop Area Estimations And Mapping Using Remote Sensing And Statistical Methods For The Province Of Prince Edward Island, Canada**
F. Bédard, G. Reichert, R. Dobbins, M. Pantel, and J. Smith

Precision Carbon Management - II
MESA VERDE ABC

Theme Chair: Dr. David Clay, South Dakota State University

1:30 **On-combine Sensing Technique For Mapping Straw Yield Within Wheat Fields**
D.S. Long, J.D. McCallum, and D.R. Huggins

1:50 **C And N Coupling Through Time: Soil C, N, And Grain Yield In A Long-term Continuous Corn Trial**
J.H. Grove, and E.M. Pena-Yewtukhiw

2:10 **Variability Of Carbon Sequestration In The Tidewater Region Of The Southeastern U.S.**
R.W. Heiniger

2:30 **Investigating Profile And Landscape Scale Variability In Soil Organic Carbon: Implications For Process-oriented Precision Management**
T.T. Brown, and D.R. Huggins

2:50 **Estimating Soil Productivity And Energy Efficiency Using Websoil Survey, Soil Productivity Index Calculator, And Biofuel Energy Systems Simulator**
K.D. Reitsma, R.K. Heimerl, and T.E. Schumacher

3:10 **Discussion**

3:30 - 4:00 Break in Exhibit Hall
GRAND MESA DEF

Tuesday, July 20, Afternoon

Engineering Technologies and Advances in Precision Agriculture - II
WIND RIVER AB

Moderator: Dr. Ken Sudduth, USDA-ARS, Columbia

1:30 **Spatial Modelling Of Agricultural Crops For Parallel Loading Operations**
G. Happich, T. Lang, and H.-H. Harms

1:50 **Developing Of A Monitoring System Of Cutting, Carrying, And Transportation Of Sugar Cane In Order To Manage Fleet**
D.G.P. Cerri, and P.S.G. Magalhães

2:10 **An Inter-connection Model Between Standard Zigbee And Isobus Network (ISO11783)**
M.F. Barros, and C.E. Cugnasca

2:30 **Rhizosphere Moisture Modulation By Water Head Precision Control**
M. Ohaba, S. Shibusawa, and H. Hosoya

2:50 **Performance Evaluation Of A Prototype Variable Rate Sprayer For Spot- Application Of Agrochemicals In Wild Blueberry Fields**
Q.U. Zaman, A.W. Schumann, D.C. Percival, T.J. Esau, S. Read, and A.W. Schumann

3:10 **Energy-efficient Wireless Sensor Network System For Soil Moisture Information Collecting**
Z. Ruirui, C. Liping, G. Jianhua, and X. Gang

Profitability and Adoption in Precision Agriculture
WIND STAR AB

Theme Chair: Dr. Terry Griffin, University of Arkansas

1:30 **Thematic And Profitability Maps For Precision Agriculture**
E.G. Souza, M.A. Uribe-Opazo, and C.L. Bazzi

1:50 **A Computer Decision Aid For The Cotton Precision Agriculture Investment Decision**
J.A. Larson, D.F. Mooney, R.K. Roberts, and B.C. English

2:10 **Typology Of Farms And Regions In EU States Assessing The Impacts Of Precision Farming-technologies**
B. Pölling, L. Herold, A. Volgmann, A. Wurbs, and A. Werner

2:30 **Vision Of Farm Of Tomorrow**
K. Charvat, P. Gnip

2:50 **Cotton Precision Farming Adoption In The Southern United States: Findings From A 2009 Survey**
D.F. Mooney, R.K. Roberts, B.C. English, J.A. Larson, D.M. Lambert, M. Velandia, S.L. Larkin, K.W. Paxton, A. Mishra, S.W. Martin, M.C. Marra. R. Rejesus, E. Segarra, C. Wang, and J.M. Reeves

3:10 **Economic Profitability Of Site-specific Pesticide Management At The Farm Scale For Crop Systems In Haute-Normandie (France)**
O. Bourgain, M. Bécu, C. Duval, and J.-M. Llorens

3:30 - 4:00 Break in Exhibit Hall
GRAND MESA DEF

Tuesday, July 20, Late Afternoon

Precision Nutrient Management - III
CHASM CREEK AB

Moderator: Dr. Tim Shaver, University of Nebraska

4:00 **NuGIS: The Development of a Nutrient Use Geographic Information System**
Q. Rund, P. Fixen, and R. Williams

4:20 **Assessment Of The Success Of Variable Rate Seeding Based On EMI Maps**
S.J. Griffin

4:40 **Site-specific Phosphorus And Potassium Fertilization Of Alfalfa: Fertilizer Usage And Sampling Density Comparison**
A.S. Biscaro, and S.B. Orloff

Spatial Variability in Soil and Crops - II
MESA VERDE ABC

Theme Chair: Dr. Terry Griffin, University of Arkansas

4:00 **Dozen Parameters Soil Mapping Using The Real-time Soil Sensor**
M. Kodaira, S. Shibusawa, and K. Ninomiya

4:20 **Spatio-temporal Analysis Of Atrazine Degradation And Associated Attributes In Eastern Colorado Soils**
M.E. Stromberger, R. Khosla, and D. Shaner

4:40 **Spatial Variability Of Spikelet Sterility In Temperate Rice In Chile**
R.A. Ortega, D.E Del Solar, and E. Acevedo

5:00 - 6:30 Poster Session and Cash Bar
2nd Floor, The Atrium, Grand Mesa DEF

Tuesday, July 20, Late Afternoon

Optimizing Farm-level Use of Spatial Technologies
WIND RIVER AB

Moderator: Dr. Robert Mullen, The Ohio State University

4:00 **Proper Implementation Of Precision Agricultural Technologies For Conducting On-farm Research**
J.P. Fulton, M.J. Darr, R.K. Taylor, and S.A. Shearer

4:20 **Economic Potential Of Monitoring Protein Content At Harvest And Blending Wheat Grain**
A. Meyer-Aurich, M. Gandorfer, A. Weersink, and P. Wagner

4:40 **Optimizing N, P, K, And S Application Across Landscapes In The Northern Great Plains Using The Plant Root Simulator (PRS™) Technology.**
K.J. Greer, M. Horsch, and J. Burns

Pros and Cons of Reflectance and Fluorescence-based Remote Sensing of Crops - II
WIND STAR AB

Theme Chair: Dr. Nicolas Tremblay, Agriculture and Agri-Food Canada

4:00 **Chlorophyll Fluorescence Approaches To Estimate The Vitality Of Plants**
R. Valcke

4:20 **Evaluation Of The Multiplex® Fluorescence Sensor For The Assessment Of Corn Nitrogen Status**
Y.P. Zhang, and N. Tremblay

4:40 **Comparative Performance Of Different Remote Sensing (RS) And Geographic Information System (GIS) Techniques Of Wheat Area And Production Estimates**
K. Al - Gaadi

5:00 - 6:30 Poster Session and Cash Bar
2nd Floor, The Atrium, Grand Mesa DEF

Wednesday, July 21, Morning

Remote Sensing Applications in PA - III
CHASM CREEK AB

Moderator: David Franzen, North Dakota State University

8:00 **Assessment Of Field Crops Leaf Area Index By The Red-edge Inflection Point Derived From Venus Bands**
I. Herrmann, A. Karnieli, A. Pimstein, Y. Cohen, V. Alchanatis, and D.J. Bonfil

8:20 **Site-specific Management For Biomass Feedstock Production: Development Of Remote Sensing Data Acquisition Systems**
T. Ahamed, L. Tian, Y. Zhang, Y. Xiong, B. Zhao, Y. Jiang, and KC Ting

8:40 **Developing An Active Crop Sensor-based In-season Nitrogen Management Strategy For Rice In Northeast China**
Y. Yao, Y. Miao, S. Huang, L. Gao, K. Yu, R. Jiang, X. Chen, M.L. Gnyp, G. Bareth, L. Zhao, and C. Liu

9:00 **Management Of Remote Imagery For Precision Agriculture**
L. García-Torres, D. Gómez-Candón, J.J. Caballero-Novella, M. Gómez-Casero, J.M. Peña-Barragán, M. Jurado-Expósito, F. López-Granados, I. Castillejo-González, and A. García-Ferrer

9:20 **Yield Limiting Factors In The Conditions Of Southern Alberta**
A. Melnitchouck, and G. Donald

9:40 **Discussion**

Precision Livestock Management
MESA VERDE ABC

Theme Chair: Dr. David Lamb, University of New England

8:00 **Precision Livestock Management: An Example Of Pasture Monitoring In Eastern Australian Pastures Using Proximal And Remote Sensing Tools**
G.E. Donald, M.G. Trotter, and D.W. Lamb

8:20 **Pasture Yield Measurement With The C-DAX Pasture Meter**
I.J.Yule., H.G. Lawrence, and R.I. Murray

8:40 **GNSS Tracking Of Livestock: Towards Variable Fertilizer Strategies For The Grazing Industry**
M.G. Trotter, D.W. Lamb, G.N. Hinch, and C.N. Guppy

9:00 **Monitoring Dairy Cow Activity With GPS-tracking And Supporting Technologies**
I. Draganova, I.J. Yule, M. Hedley, K. Betteridge, and K. Stafford

9:20 **A Preliminary Evaluation Of Proximity Loggers To Detect Oestrus Behaviour In Grazing Dairy Cows**
D.M. McNeill, G.J. Bishop-Hurley, L.D. Irvine, and M.J. Freeman

9:40 **Spatial Livestock Research In Australia And New Zealand: Towards A Cooperative Research Model**
I.J. Yule

10:00 - 10:30 Break in Exhibit Hall
GRAND MESA DEF

Wednesday, July 21, Morning

Global Proliferation of Precision Agriculture and its Applications
WIND RIVER AB

Moderator: Dr. Marc Vanacht

8:00 **Worldwide Adoption Of Precision Agriculture Technology: The 2010 Update**
T.W. Griffin, R. Bongiovanni, and J. Lowenberg-DeBoer

8:20 **Precision Agriculture In New Zealand's Farming Systems**
C.H. Mackenzie

8:40 **Precision Weed Management Research Advancement In The Near East**
H. Z. Ghosheh

9:00 **Is Precision Agriculture Feasible In Cocoa Production In Ghana? : The Case Of "Cocoa High Technology Programme" In The Eastern Region Of Ghana**
M. Bosompem, J.A. Kwarteng, and E. Ntifo-Siaw

9:20 **Land Information System Of Precision Farming In Mongolia Using Remote Sensing And Geographical Information System**
B. Erdenee, B. Batbayar, and R. Tateishi

9:40 **Road Map For Precision Agriculture In The Punjab, North-west India**
R. Kumar

Modeling and Geo-Statistics - II
WIND STAR AB

Moderator: Dr. Bruno Basso, University of Basilicata, Italy

8:00 **Crop Rotation Impacts 'Temporal Sampling' Needed For Landscape-defined Management Zones**
E.M. Pena-Yewtukhiw, and J.H. Grove

8:20 **Accounting For Spatial Correlation Using Radial Smoothers In Statistical Models Used For Developing Variable-rate Treatment Prescriptions**
K.S. McCarter, and E. Burris

8:40 **Wheat Growth Stages Discrimination Using Generalized Fourier Descriptors In Pattern Recognition Context**
F. Cointault, A. Marin, L. Journaux, J.C. Simon, R. Martin, and J. Miteran

9:00 **Discussion**

10:00 - 10:30 Break in Exhibit Hall
GRAND MESA DEF

Wednesday, July 21, Morning/Mid-morning

Spatial Variability in Soil and Crops - III
The Highlands

Moderator: Dr. Sakae Shibusawa,
Tokyo University of Agriculture and Technology

8:00 **Does Pasture Longevity Under Direct Grazing Affect Field-scale Sorghum Yield Spatial Variability In Crop-pasture Rotation Systems?**
M.V. Pravia, J.A. Terra, and A. Roel

8:20 **Spatial And Temporal Changes In Atrazine Degradation Rates In Soil**
D.L. Shaner, R. Khosla, and M. Stromberger

8:40 **Development Of Batch Type Yield Monitor For Small Fields**
M. Singh, A. Sharma, and G. Singh

9:00 **Vlite Node – New Sensor Technology For Precision Farming**
K. Charvat, Z. Krivanek, K. Charvat jr., M. Alberts, and P. Gnip

9:20 **Impact Of Winter Grazing On Forage Biomass Topography Soil Strength Spatial Relationships**
E.M. Pena-Yewtukhiw, D. Mata-Padrino, and W. Bryan

9:40 **Application Of A Canopy Multisensor**
A. Thomsen, and K. Schelde

ISPA
International Society of Precision Agriculture
www.internationalsocietyofprecisionagriculture.org

10:30-11:30
Business Meeting of the International Society of Precision Agriculture
GRAND MESA ABC

10:00 - 10:30 Break in Exhibit Hall
GRAND MESA DEF

11:30 - 12:00 Closing Remarks
GRAND MESA ABC

Monday, July 19

THE HIGHLANDS

A to Z: Precision A to Z for Practitioners - I
Moderator: Dr. D. Brian Arnall

10:20 **Extending "Precision AG" Technologies In Oklahoma**
D. Brian Arnall

10:40 **Revising Nitrogen Recommendations For Wheat In Response To The Need For Support Of Variable-rate Nitrogen Application**
D.W. Franzen, G. Endres, R. Ashley, J. Staricka, J. Lukach, and K. McKay

11:00 **From Rapideye's SPAD In The Sky To N Application Maps**
K. Schelling, R.S. Schulthess, and D. Weist

11:20 **Estimating Crop Biomass And Nitrogen Uptake Using Cropspectm, A Newly Developed Active Crop-canopy Reflectance Sensor**
S. Reusch, J. Jasper, and A. Link

11:40 **Multiplex : A New Diagnostic Tool For Management Of Nitrogen Fertilization Of Turfgrass**
S. Lejealle, S. Evain, and Z.G. Cerovic

A to Z: Precision A to Z for Practitioners - II
Moderator: Dr. Robert Mullen

1:30 **Temporal Variability Of Crop Response To Fertilizer**
R.W. Mullen

1:50 **Real World (on-farm) Implementation Of Sensor Based VRN In Mid-atlantic Corn Production**
J. McGrath

2:10 **Precision Irrigation To Improve Water Use Efficiency**
S. White, J. Adkins, and C. Whaley

2:30 **Effect Of Sub-surface Drip Irrigation And Shade On Soil Moisture Uniformity In Residential Turf**
D.L. Kieffer, and J.T. Campbell

2:50 **Site-specific Nematode Management For Potatoes In Idaho Using 1,3-dichloropropene; Experiences And Economics**
B.A. King, and J.P. Taberna, Jr.

3:10 **Variable Seeding Rates: Optimizing Yield Opportunity And Minimizing Seed Costs**
R. Heiniger

A to Z: Precision A to Z for Practitioners - III
Moderator: Dr. Terry Griffin

1:30 **Adoption And Use Of Precision Agriculture Technologies By Practitioners**
A.T. Winstead, S.H. Norwood, T.W. Griffin, M. Runge, A. Mims Adrian, J. Fulton, and J. Kelton

1:50 **Networking Advances Emerging Agricultural Technologies**
D.L. Varner, B.L. Schmidt, D.L. Kahl, and J.D. Ellis

2:10 **20/20 Vision On Precision---What The Last 20 Years Has Shown Us / What The Next 20 Promises To Give Us**
H. Reetz

Tuesday, July 20

THE HIGHLANDS

A to Z: Precision A to Z for Practitioners - IV
Moderator: Dr. Steve Phillips

8:00 **RapidEye Satellite Imaging Services -- Ground Cover, Chlorophyll, and The Red Edge**
K. DuPont

8:20 **Precision Placement Of P And K**
T.S. Murrell

8:40 **Variable Rate Application Of Potassium Fertilizer For Soybean Crop Growth In A No-till System**
A.C.C. Bernardi, L.M. Gimenez, C.A. Silva, and P.L.O.A. Machado

9:00 **Using Late-season Uncalibrated Digital Aerial Imagery For Predicting Corn Nitrogen Status Within Fields**
P.M. Kyveryga, T.M. Blackmer, and R. Pearson

9:20 **A Crop And Soil Strategy For Sensor-based Variable-rate Nitrogen Management**
D.F. Roberts, J.F. Shanahan, R.B. Ferguson, V.I. Adamchuk, and N.R. Kitchen

9:40 **Oenoview : Bringing Remote Sensing To Wine Quality**
H. Douche, V. Lefevre, H. Poilvé, and J. Rousseau

A to Z: Precision A to Z for Practitioners - V
Moderator: Dr. Steve Phillips

10:30 **Optical Sensor Advancements In Latin America**
S.B. Phillips

10:50 **Precision Ag In New Zealand**
C. Mackenzie

11:10 **PA Education: Using Social Media**
A. Winstead

A to Z: Precision A to Z for Practitioners - VI
Moderator: Dr. Harold Reetz

1:30 **A Systematic Approach For Using Precision Agriculture Tools For On-farm Evaluations In Iowa**
T.M. Blackmer, and P.M. Kyveryga

1:50 **Connected Farm, A New Technology To Track Application Equipment Via GPS And Cell Phone Technology Live In The Field**
B. Hardie

2:10 **Satellite Based Energy Balance For Mapping Riparian Evapotranspiration**
G. Gergert

TOPIC	BOARD #	POSTER TITLE	AUTHOR(S)
ENGINEERING TECHNOLOGIES AND ADVANCES	1	Development Of Unmanned Aerial Vehicles For Site-specific Crop Production Management	Y. Huang, W.C. Hoffman, Y. Lan, S. J. Thomson, and B. K. Fritz
	2	Prediction Of Soil Moisture Content And Penetration Resistance Using Real-time Soil Meter	A.Hakberdiev
	3	Study On Application Of Wireless Sensor Networks For Precision Agriculture	G. Xu, L. Chen, R. Zhang, J. Guo, and Y. Wang
	4	Precision Agricultural Branding Using Near-infrared Spectroscopy System	Y. Kojima, S. Shibusawa, R. Fusamura, and M. Sondoa
	5	Evaluation And Contrast Of An Auto Guidance System Operating On A Sugar Cane Harvester In Brazil	F.H.R. Baio
	7	Computer Model By A Linear Program And Via Internet To Select Agricultural Mechanized Systems Based On The Smallest Operational Cost	F.H.R. Baio, A.D. Rodrigues, and G.S. Santos
	9	Tip Flow Uniformity When Using Different Automatic Section Control Technologies During Field Operations	A. Sharda, J.P. Fulton T.P. McDonald, D. Mullenix, J.D. Luck, and S.A. Shearer
	11	Attaching multiple conductivity meters to an all-terrain vehicle to speed up precision agriculture soil surveys	Evan Morris, Alex Clarke, Sean Sunley, Chris Hill, and Grant Cransfield
MODELING & GEO-STATISTICS	6	Mapping The Effect Of Food Prices, Productivity And Poverty In The Development Domains Of Nigeria	O.E. Olayide, A.E. Ikpi, V.O. Okoruwa, and V.O. Akinyosoye, T. Alabi, and T. Omodele
	13	Smoothness Index Of Thematic Maps	C. L. Bazzi, J. Carnieletto, D. M. Rocha, and E.G. Souza
	15	Evaluation Of Yield Maps Using Fuzzy Indicators	E. Krueger, D.A. Kurtener, and H. A. Torbert
	17	Development Of A Decision Support System For Precision Areawide Pest Management In Cotton Production	Y. Lan, W.C. Hoffmann, J.K. Westbrook, Y. Hang, and H. Zhu
	18	Mapping Soil Salinity Using Cokriging Method In Arsanjan Plain, Southern Iran	M. Baghernejad, and M. Emadi
	19	Integration Of Geospatial Technologies With Agro-ecosystem Models For Sustainable Agriculture	V.C. Patil, and K. Al - Gaadi
PRECISION NUTRIENT MANAGEMENT	8	Cotton NDVIResponse To Applied N At Different Soil EC Levels	P.J. Bauer, D.E. Evans, and E. E. Strickland
	10	Study Of Nitrogen Fixation And Nodulation In Annual Medic(medicago Rigidula) In Inoculation With Foreign And Inside Root Symbiotic Bacteria	E. Nabizadeh
	12	Site Specific Management Of An Oxisol Cultivated With Corn For Application Of Lime And Gypsum	A.M. Coelho, G.J. de O. Lima, and T.F. Cunha
	14	Laboratory Evaluation Of Ion-selective Electrodes For Simultaneous Analysis Of Macronutrients In Hydroponic Solution	H.-J. Kim, D.-W. Son, Y.-J. Kim, D.-S. Park, and K.A. Sudduth
	16	Effect Of Nitrogen Application Rate On Soil Residual N And Cotton Yield	M. Parajulee, S. Carroll, R.m Shrestha, D. Neupane, and C. Wang

Poster Sessions–Monday

TOPIC	BOARD #	POSTER TITLE	AUTHOR(S)
SPATIAL VARIABILITY IN CROP, SOIL AND NATURAL RESOURCES	20	Spectral Discrimination Of Early Dchinochloa Crasgalli And Echinochloa Crusgalli In Corn And Soybean By Using Support Vector Machines	W. Deng, G. W. Wu
	21	On The Go Soil Sensor For Soil Ec Mapping	N. N. Sulastri, S. Shibusawa, and M. Kodaira
	22	Nitrogen Loss In Corn Production Varies As A Function Of Topsoil Depth	E.B. Allphin Jr, N.R. Kitchen, K.A. Sudduth, A. Thompson
	23	The Soil P205 Mapping Using The Real Time Soil Sensor	M. Kodaira, Y. Nagami, S. Shibusawa, and R. Kanda
	24	Interaction Between Air Spray Drift And Climatic Conditions Creating Drift Map Related To The Aerial Application Of Pesticides Using Low Volumes In Brazil	F.H.R. Baio, and U.R. Antuniassi
	25	A Case Study For Variable-rate Seeding Of Corn And Cotton In The Tennessee Valley Of Alabama	J.P. Fulton., A. Winstead, J. N. Shaw, D. Rodekhor, and C. J. Brodbeck
	26	Estimating Soil Moisture And Organic Matter Content Variabality Using Electromagnatic Induction Metod	A.Farooque, Q. Zaman, A. Schumann, D. Percival, and T. Esau
	27	Validation Of On-the-go Soil Ph-measurements – Primary Results From Germany	H.-W. Olfs, A. Borchert, and D. Trautz
	28	Carbohydrate Reserves On Tapping Systems And Production Of Hevea Brasiliensis	P. Chantuma, A. Chantuma, A. Lacointe, T. Améglio, P. Kasemsap, S. Thanisawanyangkura, A. Guilliot, E. Gohet, A. Clément, and P. Thaler
	29	Spatial Variability Of Important Soil Characteristics In Semiarid Ecosystems, A Case Study In Arsanjan Plain, Southern Iran	M. Baghernejad, and M. Emadi
	30	GPS Guidance Of Mechanized Site Preparation In Forestry Plantations: A Precision Forestry Approach	S.C. Husband
	31	Spatial Variation Patterns Of Soil Properties And Winter Wheat Growth Parameters In China National Experiment Station For Precison Agriculture	X. Xue, L. Chen, S. Li
	32	Soil Quality Improvement Through Proper Combination Of Tillage, Nitrogen Fertilization And Cover Cropping Systems	T.B. Sapkota, P. Barberi, D. Antichi, and M. Mazzoncini
SENSOR APPLICATION IN MANAGING IN-SEASON CROP VARIABILITY	34	Estimation Of Sugar Beet Yield Brfore Harvesting Using Meteorological Data And Spot Satellite Data	C. Hongo, and K. Niwa
	35	Investigation Of Crop Varieties At Different Growth Stages Using Optical Sensor Data	H. Zhang, R. Lacey, Y. Lan, C P.C. Suh, J.K. Westbrook, and W.C. Hoffmann
	36	Real-time Calibration Of Active Crop Sensor System For Making In-season N Applications	K.H. Holland, and J.S. Schepers
	33	A Model For Wheat Yield Prediction Based On Real-time Monitoring Of Environmental Factors	B. Dumont, F. Lebeau, F. Vancutsem, C. Moureaux, B. Bodson, M-F. Destain, and J-P. Destain
	37	Changes Of Data Sampling Procedure To Avoid Energy And Data Losses During Microclimates Monitoring With Wireless Sensor Networks	J.C.C. Benavente, C.E. Cugnasca, M.F. Barros, and H.P. Santos

TOPIC	BOARD #	POSTER TITLE	AUTHOR(S)
SENSOR APPLICATION IN MANAGING IN-SEASON CROP VARIABILITY (CONTINUED)	38	Development Of A Nitrogen Requirement Algorithm Using Ground-based Active Remote Sensors In Irrigated Maize	T.M. Shaver, R. Khosla, and D.G. Westfall
	39	Optimizing Vineyard Irrigation Through The Automatic Resistivity Profiling (arp) Technology. The Proposal Of A Methodological Approach	G. Ghinassi, P.P. Pagni, and M. Vieri
	40	Canopy Reflectance-based Nitrogen Management Strategies For Subsurface Drip Irrigated Cotton	K. F. Bronson, and A. Malapati

Poster Sessions–Tuesday

TOPIC	BOARD #	POSTER TITLE	AUTHOR(S)
REMOTE SENSING APPLICATION IN PRECISION AGRICULTURE	1	Canopy Reflectance Sensing As Impacted By Corn Hybrid Growth	A.H. Sheridan, N.R. Kitchen, and K.A. Sudduth
	2	Artificial Neural Network Techniques To Predict Orange Spotting Disease In Oil Palm	S. Liaghat, S.K. Balasundram, G. Vadamalai, M.H.A. Husni, and H.Z.M. Shafri
	3	Soybean Canopy Response To Charcoal Rot In Arkansas: Observations Using Crop Circletm (ACS-470).	S.S. Kulkarni, M. Doubledee, S. G. Bajwa, and J. C. Rupe
	4	The Use Of A Ground Based Remote Sensor For Winter Wheat Grain Yield Prediction In Northern Poland	S. Samborski., M. Stêpieñ, D. Gozdowski, and E.S. Dobers
	5	Active Sensor For Real-time Determination Of Soil Organic Matter	J.S. Schepers, and H. Holland
	6	Multisensor Data Fusion Of Remotely Sensed Imagery For Crop Field Mapping	Y. Ian, H. Zhang, C. Yang, R. Lacey, D. Martin, K. Zhao, Y. Hang, W.C. Hoffmann, and H. Zhu
	7	Apparent Electrical Conductivity Calibration In Semiarid Soils: Ion-pair Correction	X.N. Amakor, A.R. Jacobson, and G.E. Cardon
SENSOR APPLICATION IN MANAGING IN-SEASON CROP VARIABILITY	8	Embedded Sensing System To Control Variable Rate Agricultural Inputs	G.T. Tangerino, R.V. Sousa, A.J.V. Porto, and R.Y. Inamasu
	9	Assessment Of Physiological Effects Of Fungicides In Wheat	C. Berdugo, U. Steiner, E-C. Oerke, and H-W Dehne
	10	Cognitive Radio In Precision Agriculture	S. Nayse, D.D.Chaudhary, and V.M. Wadhai
	11	Design And Evaluation Of A Yield Monitoring System For Pistachios	U.A. Rosa, H. Choi, D. Pursell, C.J. Gliever, S.K. Upadhyaya, T.S. Rosenstock, and P.H. Brown
	12	Edxrfs-based Sensing Of Phosphorus And Other Mineral Macronutrient Distribution In Field Soils	T. H. Dao
PROFITABILITY, SUSTAINABILITY, AND ADOPTION	13	Variable-rate Irrigation Management For Peanut Using Irrigator Pro	K. C. Stone, P.J. Bauer, W. J. Busscher, J. A. Millen, D.E. Evans, and E. E. Strickland
	14	Timeliness In Agricultural Credit Delivery: A Precision Tool For Improved Farm Output And Income For Cocoa Farmers In Nigeria	J.O. Lawal, B.T.Omonona, and K.A. Oluyole
	15	Economic Analysis Of Auto-swath Control For Alabama Crop Production	A. Troesch, D.K. Mullenix, J.P. Fulton, A.T. Winstead, S.H. Norwood, and Ajay Sharda
	16	Precision Farm Labour Supply For Effective Cocoa Production In Nigeria	K.A. Oluyole, and J.O. Lawal
	17	Economics Of Precision Agriculture For Wheat And Barley Cultivation In Hamedan, Western Iran	M.B. Lak, and F. Khosro Anjom

TOPIC	BOARD #	POSTER TITLE	AUTHOR(S)
PROFITABILITY, SUSTAINABILITY, AND ADOPTION (CONTINUED)	18	Pa Adoption By A Korean Rice Farming Group: Case Study Of Pyeongtaek City	S.-O. Chung, H.-M. Yoo, and S.-D. Hong
	19	Precision Agriculture Development In Canada	D. E. Haak
PRECISION CONSERVATION	20	Minimizing On-farm Point Source Contamination Of Pesticides Using The "Biobed" Method	F. Eivazi
	21	A New GIS Approach To Assess Nitrogen Management Across The USA	J. A. Delgado
	22	The Application Of Fertilizer Using Management Zone (MZ) In Pampas Soils With Texture Variability Affects Residual Nitrate After Harvest	M.B. Rodriguez, G Civeira. S. Urricariet, P. Muschietti, and R.S. Lavado
	23	Contour Planting: A Strategy To Reduce Soil Erosion On Steep Slopes	D.S. Long, S.B. Wuest, J.D. Williams, R. Rauwendall, and M.J. Bailey
PRECISION HORTICULTURE	24	Normalized difference vegetative index for evaluating turfgrass color: a comparison of two handheld devices	Justin Q. Moss, Xiaowei Pan, and Yang Tian
	25	Design And Experiment On Target Spraying Robot For Greenhouse	W. Ma, C. Zhao, X. Wang, L. Chen, and Z. Meng
	26	Indirect measurement of creeping bentgrass N, chlorophyll, and color for precision golf green management	Justin Q. Moss, and Gregory E. Bell
	27	Development Of A Precision Sensing Sprayer For The Application Of Nitrogen Fertilizer To Turfgrass	J.Q. Moss, G.E. Bell, J.B. Solie, M.L. Stone, D.L. Martin, and M.E. Payton
	28	Research On Nutrition Detection Technology Of Soil And Leaf Of Citrus Based On Spectroscopic Techniques	S.L. Yi, L. Deng, S.L. He, and Y.Q. Zheng
PRECISION LIVESTOCK MANAGEMENT	29	Gps Tracking Of Sheep To Investigate Shelter And Shade Use In Relation To Climatic Conditions	D. Taylor, W. Brown, I. Price, M. Trotter, D. Lamb, and G. Hinch
PRECISION CARBON MANAGEMENT	30	Application Of Precision Agriculture In Carbon Farming Practices Using The Real-time Soil Sensor	Y.Li, S.Shibusawa, M.Kodaira, R.Takazawa, S.N. Nyoman, and Y.Nagami
PRECISION WEED MANAGEMENT	31	Sensing The Inter-row For Real-time Weed Spot Spraying In Conventionally Tilled Corn Fields	L. Longchamps, B. Panneton, M.-J. Simard, G. D. Leroux, and R. Thériault
	32	Partial Weed Scouting For Exhaustive Real-time Spot Spraying Of Herbicides In Corn	L. Longchamps, B. Panneton, M.-J. Simard, G. D. Leroux, and R. Thériault
	33	Generating Herbicide Effective Application Rate Maps Based On GPS Position, Nozzle Pressure, And Boom Section Actuation Data Collected From Sprayer Control Systems	J.D. Luck, S.K. Pitla, S.A. Shearer, A. Sharda, and J.P. Fulton
	34	Effect Of Precision Guided Cultivation On Weed Control In Wide Row Cropping Systems	M.L. Gupta, D.L. George, and L. Norton

Poster Sessions–Tuesday

TOPIC	BOARD #	POSTER TITLE	AUTHOR(S)
EDUCATION AND TRAINING IN PRECISION AGRICULTURE	35	Farmer Perspectives Of Precision Agriculture In Western Australia	R. Mandel
	36	Adoption, Data Use, And Training Needs Of Precision Farming Technology In Ohio	F. Diekmann, and M. T. Batte
PRECISION NUTRIENT MANAGEMENT	37	Precision Manure Management: It matters where you put your manure	Matshwene E. Moshia, R. Khosla, Jessica Davis, and Dwayne Westfall
	38	Evaluation Of Different N Management Strategies Using A Tool For Fuzzy Multi Attributive Comparison Of Alternatives	E.D. Krueger, D.A. Kurtener, V.P. Yakishev, and R.N. Ermakov, and R. Khosla
	39	Site-specific Fertilization Management: Influence Of The Past History Of The Addition Of Fertilizers On The Intra Field Variability Of The Rate Of P And K In The Soil.	M. Bécu, C. Duval, V. Debandt, S. Taïbi, and J-M. LLorens

Conference Sponsors

We would like to thank the following organizations for their sponsorship.

Platinum Sponsor

AGCO ALWAYS GROWING™

Springer
the language of science

Silver Sponsors

ALABAMA PRECISION AG EXTENSION

كرسي أبحاث الزراعة الدقيقة
PARC
Precision Agriculture Research Chair
King Saud University
Saudi Arabia

Bronze Sponsors

Simplot
Bringing Earth's Resources to Life

Agrium Advanced Technologies
Smarter Ways To Grow™

ISPA
International Society of Precision Agriculture
www.internationalsocietyofprecisionagriculture.org