

ISPA AND PRECISION AGRICULTURE AROUND THE WORLD

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ISPA President-Elect

With the contribution of the ISPA Board



*International Society
of Precision Agriculture*

Mandate

- The International Society of Precision Agriculture (ISPA) is a non-profit professional scientific organization. The mission of ISPA is to advance the science of precision agriculture globally.



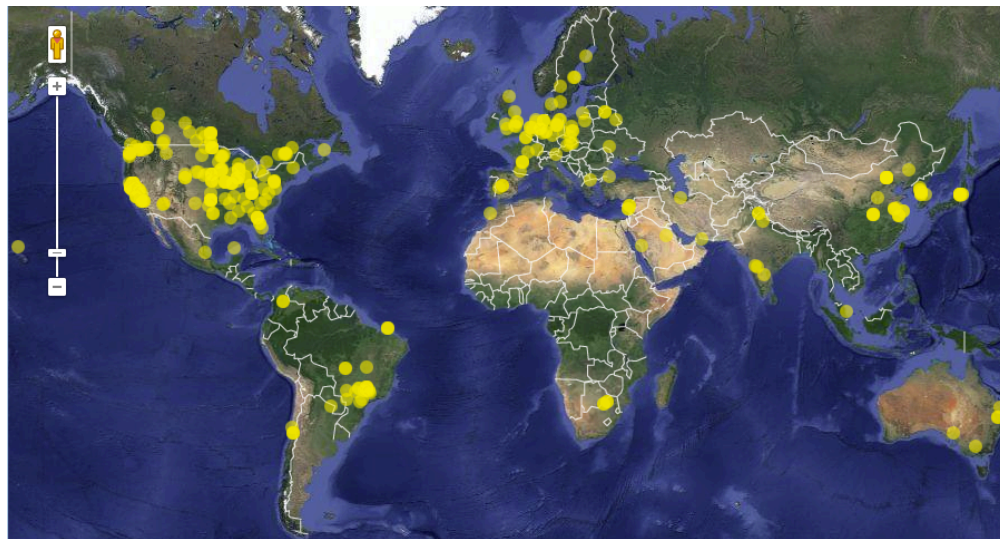
Purposes of ISPA

- Organize and conduct **international conferences** related to precision agriculture (PA), such as International Conference on Precision Agriculture, European Conference on Precision Agriculture, and other related conferences.
- Develop and maintain a **web-portal** to communicate the latest developments in PA with the world, and maintain communications among society members.
- Publish the ISPA **e-newsletter** for members and other subscribers.
- Provide members an opportunity for publication of original scientific research in the society sponsored peer-reviewed journal, ***Precision Agriculture***.



ISPA Today

- Structure
 - Board
 - Communities
 - Country representatives
 - Regional chapters
- Conferences
 - ICPA
 - Affiliated: ECPA, ACPA
- Partnerships
 - IPNI & Colorado State University (founding sponsors)
 - Journal of Precision Agriculture
 - PAQ Interactive



Map of registrants to the 12th ICPA



Leadership

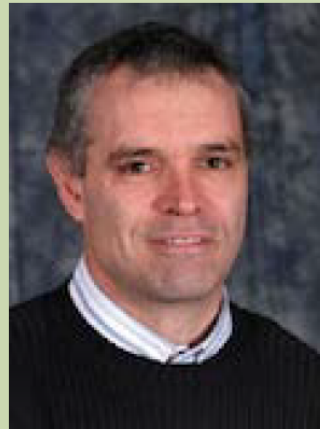
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Secretary

V. Adamchuk



Treasurer

T. Fickenscher



Past-President

J. Stafford



Founding President

R. Khosla



A brief history of ICPAs

ICPA	Year	Chairperson	Papers	Participants	Countries
1 st	1992	P.C. Robert	43	173	6
2 nd	1994		72	347	8
3 rd	1996		147	570	12
4 th	1998		203	807	27
5 th	2000		233	714	18
6 th	2002	D. Mulla	199	523	25
7 th	2004		176	455	25
8 th	2006		136	300	NA
9 th	2008	R. Khosla	231	488	43
10 th	2010		258	>400	>42
11 th	2012		-	460	47
12 th	2014	J. Stafford	180	399	37

A poster at ICPA 2014

Effect of Precision Agriculture Adoption on U.S. Corn Farm Profits¹

Introduction

Farm managers adopt new technologies only after weighing the full costs and benefits of proposed investments. Precision agriculture (PA) technologies require a significant investment of capital and operators' time, with the potential for cost savings and higher yields through more precise management of inputs based on field information.

Until very recently, the adoption of PA technologies by field crop producers had been sluggish, but the 2010 Agricultural Resource Management Survey (ARMS) of corn

Joint Technology Adoption

Before presenting estimated results for specific individual technologies, the point should be made that many of these technologies are linked to each other. Yield monitoring provides data that require an additional level of technology to analyze using maps:

- Yield monitor adoption was over twice as prevalent as either yield mapping or VRT in 2010.

- Those who have adopted yield monitoring are far more likely to have also created a



Adoption of the three technologies is influenced by similar factors (results for guidance and VRT in table):

- A scale effect for adoption is detected, with larger farms having higher adoption rates for all three technologies in 2010.
- Soil testing for nutrient deficiencies is a complement to the adoption of mapping and VRT, but not guidance systems.
- Yield goal, representing the farmer's yield potential for a farm, has a negative effect on adoption. Since yield goals are generally lower for poorer quality land and on parcels resistant to the application of favored production practices, PA may be used to offset some of these yield limitations.
- Use of biotech corn production technologies like genetically engineered seeds was only significant in explaining adoption of VRT.

All three technologies failed to contribute directly to aggregate corn-farm operating profits.

Estimated impacts of variables affecting adoption and profit are consistent across the different technologies, even though different farms adopted different technologies, demonstrating a robust modeling strategy and reliability of factors influencing profit.

- When a farmer's primary occupation is corn farming and the operation is not highly leveraged, the adoption of any of the three technologies has a negative and significant effect on profits. Primary occupation is not significant itself, but primary operators with a high assets-to-debt ratio had larger profits.

- A recent tractor purchase is associated with higher profits after controlling for geographical location.

Estimated results seem to indicate that these PA technologies are in early adoption stages and that benefits for corn farming profits in 2010 were yet to be realized.

References

- Ebel, Robert, and D. Schimmelpennig. 2011. "The Information Age and Adoption of Precision Agriculture," *Amber Waves*. U.S. Dept. of Agriculture, Economic Research Service, Dec.
- Fernandez-Cornejo, Jorge, C. Klotz-Ingram, and S. Jans. 2002. "Farm-level Effects of Adopting Herbicide-Resistant Soybeans in the U.S.A.," *Journal of Agricultural and Applied Economics* 34(1): 149-163.
- Schimmelpennig, David, and R. Ebel. 2011. *On the Doorstep of the Information Age: Recent Adoption of Precision Agriculture*. EIB-80, U.S. Dept. of Agriculture, Economic Research Service, Aug.

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*Mean differences significant at 99% confidence level using paired t-tests.

(1)

Genetically engineered seeds	-0.068 (0.36)	0.293 (2.12)*
Soil testing	0.174 (1.81)	0.187 (2.21)*
Yield goal	-0.547 (5.85)**	-0.585 (8.67)**

T-statistics * p<0.05 ** p<0.01

Wald test of independent equations (rho = 0): chi-squared(1) = 14.82(1), 98.61(2). Prob > chi-squared = 0.0001

Source: 2010 Agricultural Resource Management Survey (ARMS) of corn producers (1,278 usable observations).



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The views expressed are those of the authors and should not be attributed to ERS or USDA.

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Sir Ronald Aylmer Fisher (1890 –1962)

- Fisher is known for his important contributions to statistics, including the analysis of variance (ANOVA), method of maximum likelihood, fiducial inference, and the derivation of various sampling distributions.
- “A genius who almost single-handedly created the foundations for modern statistical science“
- “The greatest biologist since Darwin”.



Consequence: scientists and farmers are not alike...

Table 1. Comparison of scientist and farmer approaches to experimentation.

Scientist-based	Farmer-based
Focus on one or two factors for maximum clarity	Multiple-factors included for maximum realism
Assumes insignificant interactions with other factors	Strong interactions observed between other factors
Intended to provide insight for all individuals	Intended to provide insight for specific individuals
Intended to provide insight for specific features	Intended to provide insight for all features present
Deals with abstract / invisible attributes	Deals with tangible / visible attributes
Hypothesis driven	Outcome driven
Focus on accuracy	Focus on relevance
Experimentation to address specific questions	Experimentation as a continuous learning process
Artefact/technology-focussed: deriving optimal parameters for individual technologies	System focussed: optimizing performance for sustainable profits
Analyses of average response	Analyses of processes

Scientists handling uncertainties

- How to address the confounding underlying variability of the natural landscape and seasons?
 - Fisher's answer: *remove it*
- Generalized scientific statements true within the bound of the experimental conditions
- Effects of factors are known, but the interaction with landscape or weather less so



Precision agriculture can help

- Traditional agronomic experimentation is not « precision agriculture-ready »
 - Little consideration for applicability of findings in each farmer's context
- Where do uncertainties come from in agriculture?
 - Mostly soils (location) + season (time)
- Precision agriculture *is* about relevance

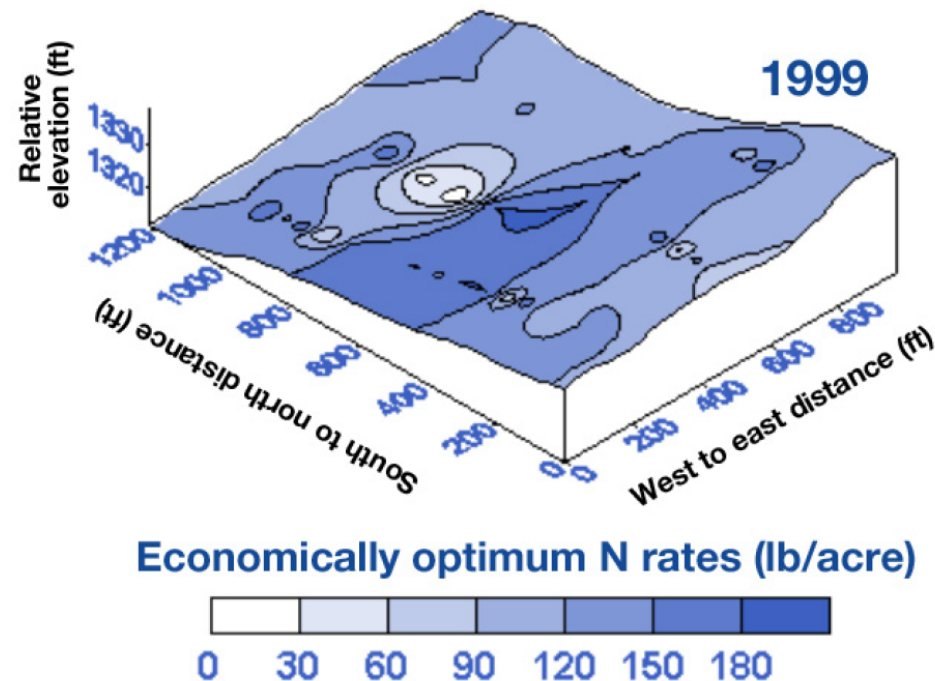


Fig. 2-26. Map of optimal N rate for corn in a field in Minnesota in two different years. In 1997, the western edge of the field needed the most N, and high landscape positions needed the least N. In 1999, an east-west ridge needed the most N, and low landscape positions needed the least N.

« Precision » should aim at space and time

Managing Nitrogen in Crop Production
Peter Scharf

2015



PA: Who Can Benefit?

- “Precision agriculture is a management strategy that uses information technology to bring data from multiple sources to bear on decisions associated with crop production”
- Technology and information are getting democratized
- Opportunities for small/big farms, wealthy / developing countries
- Still work to do to achieve:
 - Productivity
 - Profitability
 - Environmental benefits



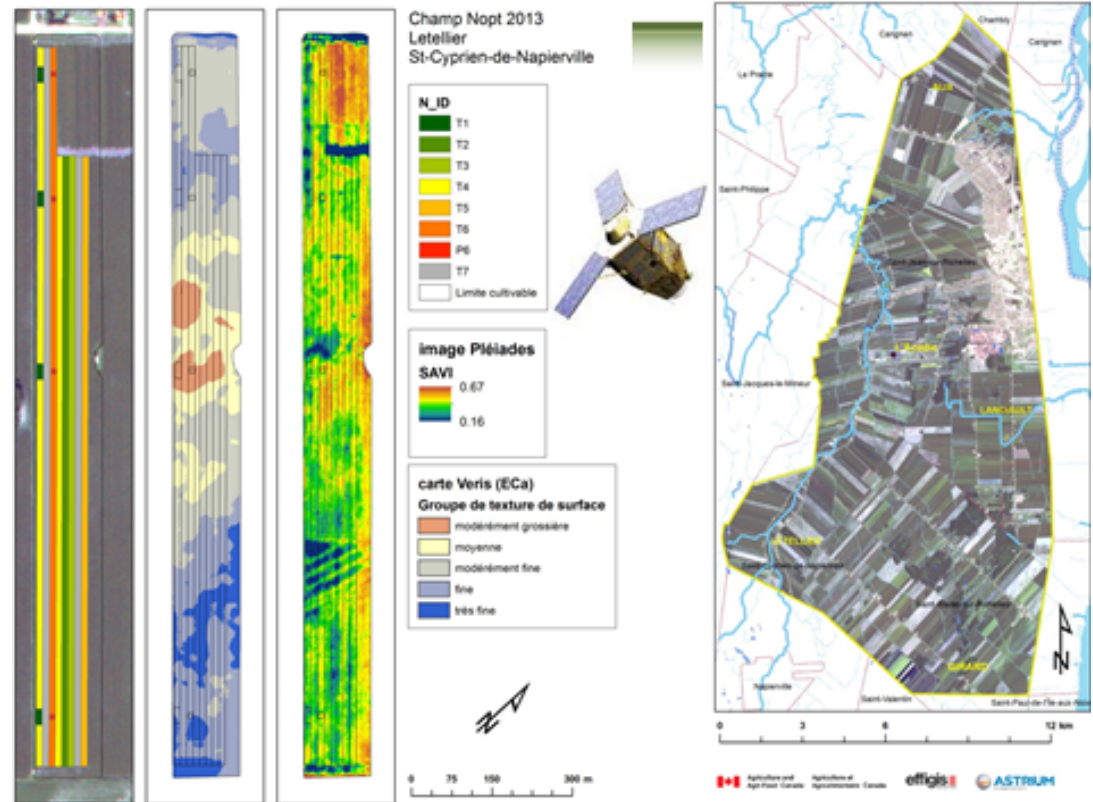
The international future of PA

- Access to data from anywhere, anytime
- Equipment will not be so well democratized but information, yes
- How valuable this information will be for science-based decision making will depend on how we switch from pre-PA to PA agronomic valuation of data at our disposal



A new paradigm

- Remote sensing
- Proximal sensing
- Digital terrain models
- Yield monitoring
- Weather data
- (Big) data mining
- Data stewardship



What role for ISPA?

- The science of agronomy will never be the same
 - Target key issues
 - Provide a platform for critical discussions and consensus generation
 - Redefine the state-of-the-art
- ISPA is committed to bridging the gap between PA science and the farm
 - Blend science-industry-farming information
 - Broadcast science-based guidelines for maximum PA benefits
 - Leadership / cooperation
- Join ISPA!

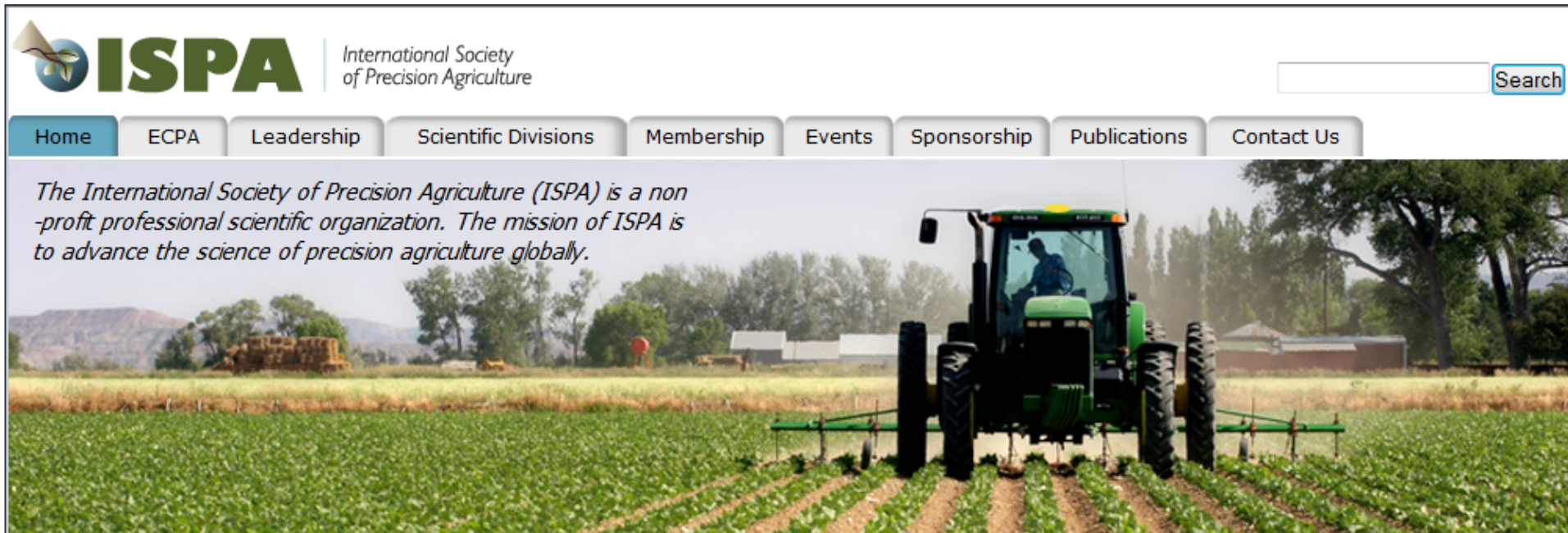


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- IPNI



13th International Conference on Precision Agriculture (ICPA)



St. Louis, Missouri, July 31 - August 4, 2016
In conjunction with the **InfoAg** Conference

