Measuring the Pulse of Technology at the 7th International Precision Agriculture Conference

Dayton Lambert & Terry Griffin
Research Assistants, Department of Agricultural Economics, Purdue University

What is the future of precision agriculture (PA)? After its debut the late-1980s/early 1990s, researchers, agribusiness, and producers expected precision agriculture and related technologies to revolutionize production agriculture. However, adoption of many PA technologies has lagged behind. The pulse of precision agriculture was gauged last month at the 7th International Conference on Precision Agriculture in Minneapolis, Minnesota, July 25 – 28 (Visit the conference website: http://precision.agri.umn.edu/Conference/).

This conference is hosted biennially by the University of Minnesota. Roughly 550 persons representing agribusiness and academia attended the meeting. Like its sister conference in Europe (The Biennial European Precision Ag Conference), this conference gives insight into cutting-edge innovations in the PA circle, and potential future paths. As one of the speakers mentioned during the opening general session, one-half of the population actively involved in PA research and development in the world were present.

This newsletter gives an overview of the conference highlights and presentation topics. Some ideas about future directions are posited based on the content, attendance, and keynote speakers.

Overview

The conference was dedicated to the memory of Pierre Robert (1941-2003), founder and director of the Precision Agriculture Center at the University of Minnesota, founding editor of the *Journal of Precision Agriculture*, and a leader in the origination, development, and dissemination of PA ideas. The purpose of the conference was to highlight research and applications in precision agriculture, and showcase new technologies and information management for agriculture.

The conference session included 83 poster presentations and exhibits, about 158 oral presentations, and opportunities to meet colleagues and practitioners working in PA related areas. Workshop presentations targeting producers and agribusiness included tutorials for hands-on software tutorials for developing yield management zones, sessions on remote sensing, and nutrient management planning.

Oral Sessions

Table 1 lists the topics of the PA conference. Remote Sensing was the most frequent topic discussed at this year's conference (22% of presentations), followed by Engineering Technology (16%), Precision Management (11%), and New Applications Worldwide (10%).

Lambert chaired one of the profitability sessions. One profitability session paper reported results on the impact of education, financial performance, and government programs on the adoption of PA technology. A second paper was about developing profitability maps for 6 years of corn and soybean yield monitor data. The two remaining papers focused on irrigation. The first paper was a simulation applying variable rate drip

fertilizer to tomatoes. The second was also a simulation, comparing drip irrigation to a uniform water irrigation system.

Lambert and Griffin each presented papers. Lambert's paper focused on increasing the value of variable rate manure using soil test information and Griffin presented a statistical simulation study comparing traditional experimental designs to yield monitor based experimental designs with fewer replications.

It is worth noting the interdisciplinary nature of the session this year. For example, Griffin, an ag economist, presented in the geostatistics/sampling section. Newell Kitchens, an ag engineer with USDA-ARS in Columbia, Missouri, presented in the profitability section. This is one example of the evolution of PA research and interdisciplinary work that is underway. In the early years of this conference there were mainly soil science and engineering presentations.

Highlights

Peter Nowak discussed adoption from a rural sociological standpoint arguing that adoption is a complex process and not a discrete event. He pointed out that no study on the adoption of PA systems existed, only on components. He compared the adoption of genetically modified soybeans and PA, and said that that PA is not yet convenient or "smart farming." This distinction is sometimes referred to as the difference between "embodied-knowledge" technologies as opposed to "information intensive" technologies. Round-up ready soybeans are an example of an embodied knowledge technology. Although the technology was new, adoption of the technology required little in terms of changing the production process. It did not require additional skills and management. On the other hand, most PA technologies are information intensive or new knowledge skills.

Gary Wagner, a Minnesota farmer, spoke about the technologies and data that are often thought of with regards to PA and "information-intensive." He also focused on the "embodied knowledge" PA technologies such as auto-guidance and light bar technology.

Nowak also presented the PA adoption data from USDA ARMS survey typically associated with Stan Daberkow. This data was just released on the USDA website (http://www.ers.usda.gov/Briefing/AgChemicals/Questions/Table1.htm), and published in the Triennial Farm Management Conference proceedings co-authored by Daberkow and Purdue staff (see Griffin et al, 2004, on this website). Nowak made mentioned of the often cited "63% PA Profitability" from Lambert and Lowenberg-DeBoer's (2000) Review of PA Profitability.

Alex McBratney, a soil scientist from University of Sydney discussed the potential of management zones and classes and on-farm experimentation. He added that economic assessments lacked whole-farm focus and were too heavily focused on single fields. He ended with stating the need to build human capital for consultants and not stopping at zones classification.

Some other notable highlights were comments made during Marc Vanact's (AG Business Consultants, Clarkson Valley, MO) general session presentation, "Status of Precision Agriculture in the US: Industry Perspective". Vanact and colleagues envision PA leaving the farmstead and entering the super market. Within five to ten years, Vanact predicts that consumers will have the ability scan produce supermarkets, labeled with barcode tags. These tags will carry information about the

methods used to produce fruits, vegetables, and meats, the origin of the produce, and the chemicals used in the production process. If consumers in the European Union and the US had access to such information recall, then issues of "GMO vs. non-GMO" or "organic vs. non-organic" would be sorted out by the market place. Another speaker in the closing session of the conference argued that the future of PA depended upon development of a "central internet information clearinghouse", and that PA adoption would not appreciably continue until this tool was established.

Conclusions: the Future of PA Research?

What does the Minnesota conference suggest about the future of PA research? Certainly, we are just beginning to understand how remote sensing technologies can be applied for decision making on the farm. Remote sensing technology is widely available. However, it is unclear whether this technology is profitable. Whole-farm budgets comparing operations that use remote sensing to those without remote sensing need to be made. Likewise, the profitability of navigation technologies, such as auto guidance needs to be assessed.

A third important avenue of research will be that of determining the optimal experimental design size and configuration for on-farm research. Recent advances in spatial statistics suggest that producers can glean information from their own planned comparisons without having to resort to the tedious replication associated with classical agronomic experiments. With spatial statistics, spatial relations between data points (for example, yield monitor or Veris EC readings) can be appropriately modeled.

Lastly, Vanact's comment is interesting. We may see PA technology leaving the fields and entering the supermarkets. If this is so, then the impact of PA on consumer demand for farm products promises to be an interesting addition to consumer science studies, product identity tracking, and product demand analysis.

Table 1. Topics Presented in Poster and Oral Sessions at the 7th PA Conference

Session	*Percent*	*Number*
Crop Quality	4%	9
Remote Sensing	22%	54
Engineering Technology	16%	38
Nat. Res. Variability	9%	22
Profitability	8%	20
Info. Mgt.	3%	7
New Applications	10%	25
Precision Mgt.	11%	26
Education/Outreach	2%	6
Environment	3%	8
Geostatistics/Sampling	8%	20
Modeling	2%	6
Total		241

For More Information:

Griffin, T.W., J. Lowenberg-DeBoer, D.M. Lambert, J. Peone, T. Payne, and S.G. Daberkow. 2004. Adoption, Profitability, and Making Better Use of Precision Farming Data. Staff Paper #04-06. Department of Agricultural Economics, Purdue University. (http://www2.agriculture.purdue.edu/ssmc/, click on Publications)