Spring 2012

Insights

The Precision Farming Magazine

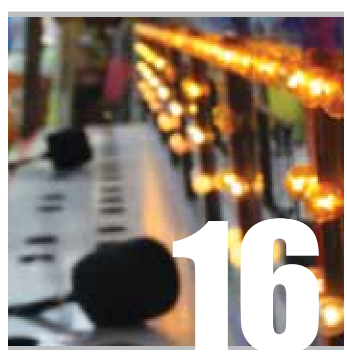
Where the Grass is Always Greener

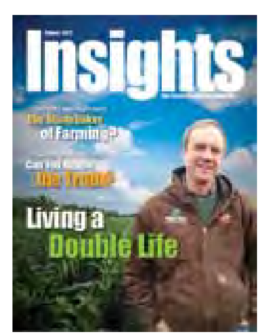
Precision ag in the developing world

Whack Away at Planting Challenges With Hydraulic Down Force

Contents

Spring 2012





Subscribe!

Not on our mailing list? Sign up for a FREE subscription to *Insights* Magazine at www.agleader.com/subscription/

2012 is an exciting time for our company and our customers. This year, we are celebrating our 20-year anniversary. For two decades, Ag Leader has provided innovative precision farming products to help producers improve management practices, make better decisions, conserve resources and protect the environment.

In this edition of *Insights*, we reflect on how far precision agriculture has come with a timeline of our company's evolution on page 10. I am proud of all that we have accomplished and am looking forward to all that is in store for the future.

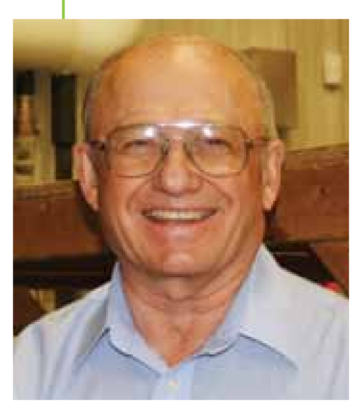
In fact, I have some exciting news to share! The Ag Leader family continues to grow and I am pleased to announce our acquisition of two leading products in the water management market, Soil-Max™ tile plows and the Intellislope™ tile plow control system. The addition of these two companies broadens our offering to include water management solutions to our precision farming product line. The Soil-Max Stealth ZD tile plow is the most advanced design on the market, and Intellislope revolutionized control of tile plows with its GPS-based control system. This GPS-based technology makes it practical for growers to do their own tiling with RTK GPS that they may already own. Previous laser-based systems were much more complex and time consuming to use. We are thrilled to bring you this new technology to help solve tiling challenges more cost effectively, and look forward to developing additional products to support water management tasks.

We look forward to an exciting year and hope you enjoy this edition of *Insights* magazine.

Best regards,

Al Myers

"Insights will show you how growers are using precision products – both old and new – to make their operations more efficient and profitable."



Precision ag in the developing world

by Madeline Fisher

"So, that's the name of the game here," Kitchen says. "It's recognizing that the variability that exists on the surface of the globe is oftentimes just as great within one field as it is between fields that are hundreds of miles apart. And that knowledge of how this variability lays in the landscape is extremely valuable for best managing the landscape."

With its emphasis on applying inputs in the right amounts and at the right times and places, precision farming seems like a natural fix to the problems facing the developing world's farmers. While developing nations consume 60 to 70% of the world's fertilizers, farmers in these countries often don't know the exact nutrient status of their lands. Global nitrogen use efficiency hovers around 40%, and water use desperately needs optimization, as well, especially in places like India where drought is threatening to expand. Most importantly, many countries struggle with low, stagnating, or declining crop yields, something that precision farming techniques promise to boost.

Yet, what seems clear-cut in theory can be remarkably tricky in reality, as Colorado State University professor and ASA and SSSA Fellow Raj Khosla began realizing about five years ago. Tapped to chair the International Conference on Precision Agriculture in 2006, Khosla suddenly found himself on the radar of people the world over, all asking the same question: How do I make these practices work in my country? At first, "that really puzzled me, that really made me think," Khosla admits, and for good reason. Precision farming in the United States, Europe, and Australia is conducted in fields that are tens to hundreds of acres in size, whereas farms in China, India, and Africa are often 5 acres or less. Moreover, conventional precision practices involve mechanization, big equipment, and sophisticated technology—tools that are way beyond the reach of smallholder farmers.

Nevertheless, precision agriculture research is expanding in the developing world today, thanks to pioneering work at places such as the International Rice Research Institute (IRRI), as well as scientists like Khosla, who have joined the international effort more recently. The first symposium of the new ASA Precision Agriculture Systems Community, held at last year's ASA, CSSA, and SSSA Annual Meetings in San Antonio, included several talks with a global focus. A few years earlier, Khosla helped launch the International Society of Precision Agriculture to advance the emerging science. And his own research collaborations in Colorado, China, and India have convinced him not only that "precision agriculture can be practiced on most fields, most farms, and most places on this planet," he says, but that it can also deliver on its promise to improve profitability, increase yields, and foster food security worldwide.

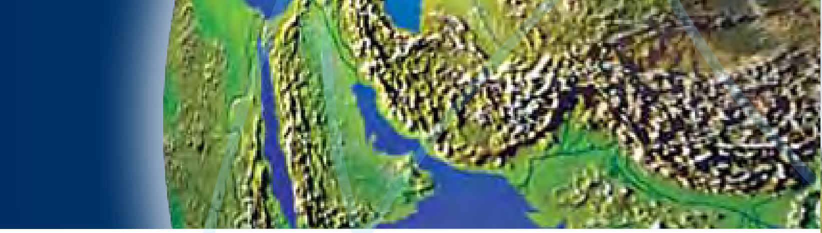
Precision planting of potato seedlings in Punjab India. Photo courtesy of Dr. Manjit S. Kang.

"I'm not proposing that precision ag is the *only* solution," Khosla said in a talk at the Annual Meetings last fall. "But I'm a strong believer that it's part of the solution."

Other scientists are less sure. But even those who agree know that bringing these techniques to the world's poorest, least developed regions means taking an uncertain path. "You have to completely reset your thinking about what precision agriculture is on a farm," says Bruce Erickson, a Purdue University precision farming expert and ASA's agronomic education manager.

Relatively New Concept

With the concept now finding its way around the globe, it's easy to forget that precision agriculture is still relatively new even in the United States. Its modern practice in fact began only in the 1990s, when global positioning systems (GPS) first became available for civilian use. Once this happened, GPS technologies for farm equipment quickly emerged, allowing farmers to map their fields in great detail and apply inputs in precise amounts and locations using variable-rate technology (VRT). Soon afterward, yield monitors linked to GPS began revealing the vast variability within farm fields while light bars and



autoguidance helped farmers steer their equipment more precisely—and thereby minimize overlapping applications of expensive seed, fertilizers, and pesticides. Most recently, sensors have been developed to quickly assess the nutrient levels in soils and plants.

Thanks to all these high-tech advances, precision agriculture has become synonymous with modern technology and large operations in many people's minds, but the basic principles are actually independent of both technology and scale, and they go back decades, Khosla says. What precision agriculture is truly about is simply site-specific farming—the idea that natural variability in soils, microclimates, plants, and other factors will respond better to customized, location-specific management practices than to approaches that treat every part of a field the same. And by tailoring inputs of fertilizers, chemicals, and water to the specific conditions within their fields, producers can cut costs, improve profitability, and boost yields.

Researchers working in developing countries have focused on this broader concept of precision farming for an important reason: When farmers are illiterate, lack capital, and cultivate fields of just 1 to 2 acres by hand, the wholesale transfer of North American precision technologies won't succeed, says Purdue University agricultural economist Jess Lowenberg-DeBoer. In Niger, West Africa, for example, where Lowenberg-DeBoer has worked extensively, the most advanced farmers "were the ones who were using bullocks or donkeys rather than doing everything by hand," he says. "And how do you put a GPS on your bullock?"

Adapting Technologies to Local Conditions

At the same time, technology is a crucial part of the solution; after all, advances like GPS are what made precision farming practical for farmers in the first place, says ASA and SSSA Fellow Newell Kitchen, a USDA-ARS soil scientist in Columbia, MO and past president of ASA. The point therefore is not to dismiss existing technologies completely, but to adapt them to the agricultural practices, economic conditions, and culture of each country. "With the technology at hand, we tend to ask, 'Well, what can we do with this?'" Kitchen says. "So, it becomes very exploratory."

Farmers in Africa and most of Asia, for example, usually lack even the most basic information about the fertility of their fields. But pulling soil cores and sending them to a laboratory for analysis isn't an option because lab facilities don't exist. One solution to the problem, says Lowenberg-DeBoer, would be to outfit local agro-dealers or extension offices with battery-operated, table-top soil testers, to which farmers could bring a composite soil sample and get a sheet of simple nutrient recommendations in return. Another would be to make use of field sensors, such as those that measure plant chlorophyll (or a related parameter) to estimate nitrogen status.

Courtesy of the International Rice Research Institute.

What precision agriculture is truly about is simply site-specific farming—the idea that natural variability in soils, microclimates, plants, and other factors will respond better to customized, location-specific management practices than to approaches that treat every part of a field the same. And by tailoring inputs of fertilizers, chemicals, and water to the specific conditions within their fields, producers can cut costs, improve profitability, and boost yields.

Precision Leveling: Boosting Yields, Saving Water

Khosla, meanwhile, has been working with researchers in India on both water and nutrient use efficiency. Many farm fields across the country are flood-irrigated, he explains; when irrigation water becomes available in canals, farmers simply open the flood gates and let water course across the land. The fields are so undulating and uneven, however, that certain areas become waterlogged while others drain too quickly, leading in both cases to wasted water and nutrients and reduced grain yields. Hypothesizing that precision farming techniques might improve the situation, Khosla and scientists from CIMMYT and IRRI carried out a study at an experimental farm on the Indo-Gangetic Plains of India, where irrigation and other demands are currently depleting groundwater by 13 to 17 km^3 a year.

The method they turned to was precision laser leveling. In the approach, a laser beam is shot across a field, giving farmers a stable reference point to go by as they level out bumps and valleys in the ground. In their study, published in the *American Journal of Plant Sciences* last October, laser leveling combined with another technique for boosting water use efficiency, raised-bed planting, produced an average of 17% more grain than traditional farming practices. What's more, the new practices led to a 50% savings in irrigation water, with laser leveling alone cutting water use by one third. That's because by distributing water more evenly, the practice brings about good seedling germination and crop development, even with less irrigation overall.

So pleased was Khosla with the results that he subsequently persuaded his collaborators at the Delhi-based company Tata Chemicals to carry out an on-farm study with two goals: to repeat the findings and demonstrate a model for offering ag services to Indian farmers. In 2011, the company worked with a wheat grower in northwestern Uttar Pradesh to laser-level his fields, perform balanced fertilization based on a few soil tests, and schedule irrigation at the right times. Before these interventions, the farmer averaged 0.8 tons per acre, reports Khosla; afterward, his yield jumped by nearly 200% to 2.25 tons per acre. "The farmer got so excited that he applied for a micro-loan, bought his own precision-leveler, and he started offering precision leveling as a service," Khosla says.

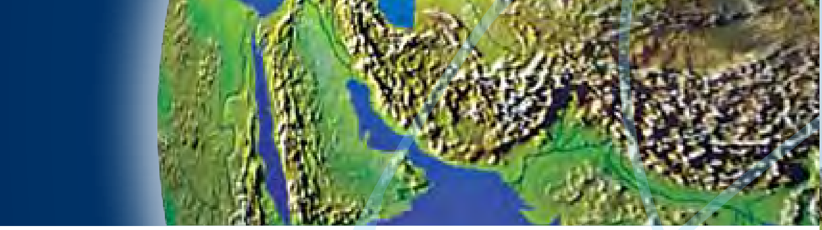
Large-Farm Technologies Will Still Play an Important Role

It's an encouraging outcome, and even more encouraging is how other precision farming techniques are now reaching significant numbers of smallholder farmers across Asia (see sidebar opposite page). Still, if these practices are truly going to help feed the world, the large, mechanized farms that also exist in some developing nations can't be ignored, cautions Erickson. In Brazil and Argentina, for example, farms can far exceed North American size, creating economies of scale that make purchasing big equipment and sophisticated technology both feasible and profitable. Yield mapping, for example—which requires installing both GPS systems and yield monitors on combines—is quite popular with some farmers in these countries, Erickson says. Because labor is so cheap, he explains, the land-owning "farmer" is often not the one who works the land, and thus relies heavily on data to track farm conditions and output.

"So, precision farming applications will come a lot quicker on these bigger, more mechanized farms," Erickson says. "There's just a more natural fit, and there's still quite a bit of room to grow, even now."

Wherever precision farming takes root, it will need all the usual supports to flourish: networks of ag retailers and service providers, education and training opportunities, industry backing, and money. But the more immediate need, say scientists like Khosla, is more people who are willing to engage in what can admittedly be a challenging research effort. And even when a technology proves valuable, an often forgotten piece is integrating it into the existing farming methods and ways of doing business of various countries. "It takes people

Data collection with the Pocket Sensor in corn and wheat in Mexico. Photo courtesy of Jared Crain, Oklahoma State University.



to implement new farming practices," Erickson says.

Recognizing Variability on Smallholder Farms

On a more basic level, many scientists remain skeptical that enough variability exists in small fields to try precision agriculture in the first place, Khosla says. Data is quickly mounting, though, that show otherwise. In a study in China that Khosla took part in, for example, winter wheat yields ranged from less than 0.8 tons per acre to more than 2, even though farm fields were just 3.5 to 17 acres in size. Kitchen has witnessed the same thing in Korea. "Some of the results I've seen suggest that the range of variability in rice yields in their small fields is not too unlike the range we have in our grain crop yields here in the U.S.," he says, "even though our fields are on the order of 50 to 100 times larger."


Courtesy of the International Rice Research Institute.

Getting smallholder farmers to recognize this variability is key not only to helping them achieve better yields and profitability, he adds, but to become better stewards of the environment, as well. As things stand now, the world's two biggest users of fertilizers—farmers in India and China—have little way of

Leveraging Cell Phone Technology

Most of the developing world's farmers may not own yield monitors or GPS systems, but what they do often have in spades are cell phones. In Africa, for example, "it's surprising," says Jess Lowenberg-DeBoer, a Purdue University agricultural economist with ties to Niger, West Africa. "People who you think don't have enough to eat have cell phones."

As a result, agricultural scientists and public health officials alike have been brainstorming ways to leverage the technology; for instance, to warn farmers about swarming locusts or approaching storms or to collect health information from people in remote areas. But in one region, at least, ideas like these are now becoming tangible solutions, thanks to work by the Philippines-based International Rice Research Institute (IRRI).

For more than a decade, a team led by IRRI deputy director general for research and ASA and SSSA Fellow Achim Dobermann has been studying ways to bring precision agriculture techniques to small rice farms in Asia, where 90% of the world's rice crop is grown. The solution they devised and tested widely is called site-specific nutrient management (SSNM), a simple form of precision farming that matches nitrogen applications to local field conditions and balances them with inputs of phosphorus and potassium. In several studies, Dobermann and his colleagues demonstrated SSNM's capacity to boost yields, nutrient use efficiency, and profits. Then the next hurdle arose: Bringing SSNM to Asian smallholder farmers.

Speaking at the ASA, CSSA, and SSSA Annual Meetings in San Antonio last fall, IRRI senior scientist and ASA and SSSA Fellow Roland Buresh described how the group first tried to disseminate SSNM recommendations in print form. But the materials quickly grew too complex, due to the vast diversity in farm practices and conditions that needed to be accounted for. So, three years ago, the team began developing a software program that asks farmers roughly a dozen questions, makes some calculations, and then delivers tailored nutrient management advice. After distributing it on CD for a time, they began offering the program via the web, smart phone, and regular cell phone.

Filipino farmers can access it with a simple cell phone, for example, by calling a toll free number that connects them to an interactive voice response system provided by a Philippines telecomm company. After they push the appropriate keypad buttons to answer questions about their farm practices—the rice variety they plant, how they manage crop residues—the information travels to a cloud-based server. The SSNM calculations are then performed, and the recommendations travel back as a text message within minutes.

The system is now operating across the Philippines and should be running soon in Indonesia, Bangladesh, parts of India and China, and even West Africa. In the meantime, the team is already taking the next step—building a broader "crop manager" system that will not only give nutrient recommendations, but also advice on land preparation, weed control, and other management topics, as well as access to credit, insurance, and other financial services.

"We started with fertilizers because fertilizers represent about 20% of the input costs for rice farmers," Buresh said. "But rice farmers need more than just fertilizer advice."

knowing where and when they've met a crop's needs or where and when excess fertilizers are spilling into the environment.

"So, that's the name of the game here," Kitchen says. "It's recognizing that the variability that exists on the surface of the globe is oftentimes just as great within one field as it is between fields that are hundreds of miles apart. And that knowledge of how this variability lays in the landscape is extremely valuable for best managing the landscape."

Getting smallholder farmers to recognize this variability is key not only to helping them achieve better yields and profitability, he adds, but to become better stewards of the environment.

M. Fisher, lead writer for CSA News magazine. Originally published in CSA News magazine and edited/reprinted with permission from the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America.

Courtesy of the International Rice Research Institute.

The Evolution of Ag Leader Technology

1992

This is the second in a continuing series about the development of Ag Leader Technology. Stay tuned for the next issue of *Insights* magazine for more information about the past, present and future growth of the company.

"After carefully weighing the pros and cons of every idea, I decided there was one that stood out to me as the one that was undoubtedly going to happen and that every farmer would want: the on-the-go yield monitor. "

Twenty years ago the field of precision agriculture was relatively unknown and Ag Leader Technology was a brand new company in diligent pursuit of making a name for itself. What has evolved over such a short period of time is truly remarkable. Today, Ag Leader is the leading name in precision agriculture and has employees across the globe in North America, Europe, South America and Australia.

Basement beginnings

It began in 1986 in Al Myers' basement. "I had been brainstorming a lot of product concepts and kept a spiral notebook of ideas," Al explained. "After carefully weighing the pros and cons of every idea, I decided there was one that stood out to me as the one that was undoubtedly going to happen and that every farmer would want: the on-the-go yield monitor. "

Realizing that someone was going to do it at some point, Al decided he wanted to be first. "I knew it would not be an easy product to develop," Al explained, "But I also knew that if I could do it well, the difficulty of making an accurate on-the-go yield monitor would be a barrier to entry into the market for competitors."

After six years of development and six generations of prototypes, Al was ready to go to market with his first product: the Yield Monitor 2000. He sold just 10 yield monitors that year, but he didn't give up. While there had been other companies attempting to develop this technology, their products weren't working as well. Al's design was the first widely successful yield monitor. So at 44 years of age, he quit his engineering job, depleted his savings and started Ag Leader Technology in 1992.

Family input

At the time, Al's sons Steve and Mike were just 13 and 11 respectively, and more interested in playing computer games than the invention that was evolving in their own home. Aside from his kids, who Al tried hard to convince that helping him build circuit boards on a Saturday afternoon was "fun," Al didn't have many people he could talk to because an invention of this magnitude needed to be done in secrecy. So he ran ideas past his father, a hard-working farmer who instilled a strong work ethic in him early on.

Al also credits his father for encouraging him to showcase his product at local tradeshows. The first show Al attended was in Peoria, Ill. "I got the very last booth available. It was 10 x 10 and located out in the hallway," reminisced Al. Today, Ag Leader attends every major farm show, showcasing a complete package of precision farming technology. Back in the day, farmers would line up to view a 13-inch color TV hooked up to a VCR that played a Yield Monitor 2000 video, and he or a satisfied customer who happened to be there would explain the product's functionality and bottom line benefits. "Farmers were fascinated," Al remembers. "But the true testimony came from those farmers who believed in it enough to try it out, and then told their friends about it." Al learned a valuable sales lesson: a satisfied customer is the best salesman around. But as his company grew, he knew he needed more than just satisfied growers to tell the story. Today Ag Leader's booth is filled with qualified precision ag experts to demo every single product and explain the value of data personally to each grower. And many folks on the Ag Leader staff are personally involved in farming. The first-hand understanding of what growers need and want has been one of Ag Leader's greatest strengths.

Ag Leader becomes *the leader*

When it came time to choose a name for his new company, Al's attorney advised him against Ag Leader Technology as he warned it was potentially too generic and could be conflicting with other companies who had already coined the moniker "leader." But Al and his father liked the name and so he made a bold move to go with it, even though it seemed strong for a start-up company. This decision, among many others Al made during the evolution, was later proved right.

By 1995, Al was selling over 1,500 yield monitors a year and was recognizing great success. He realized early on it was a product that would mature rapidly and would someday become standard equipment. Yield monitoring was the first precision farming practice to be adopted by a majority of growers. Today, nearly every new combine is shipped from the factory with yield and moisture sensors, and Ag Leader supplies the majority of the sensors installed on new combines today. From yield monitors to a complete package of precision farming tools, Ag Leader will continue to bring the most innovative technology to the market for many years to come.

Early Prototypes

1986

1988

1990

Meet Michael Vos: Precision Farming Geek ... In A Good Way.

Michael Vos isn't just your typical 2,000-acre farmer from southeast Iowa. Okay, maybe he is. But he's also an accomplished farm geek at a time when being one is pretty chic – and profitable. See, Vos has turned his operation into a working science experiment, testing different practices, challenging traditions and twisting data – with the goal of wringing out more profits every season and every year.

There's probably not a better person for this role. Why? Not only is Michael a true evangelist for collecting and using precision farming data, but Vos also serves as Software Sales Manager at Ag Leader, which allows him to see firsthand the challenges that growers face in sifting through the maze of technology and data available to those using precision farming.

Listening to Vos at a presentation or one of his many online webinars gives you a better appreciation of the value of precision farming data that is available, but often unused. Following is a Q & A interview with Michael about the Value of Data:

Q: You talk a lot about the Value of Data? Explain.

A: The information that is recorded from precision ag displays has a tremendous value for showing the 'truth' about much of the common questions on the farm. Data is very valuable in this sense. It can help you understand what's going on across your field, so you can make decisions about everything you do in the field – the timing of tillage, the best seed types, what and when you should be applying products and more. One of the biggest challenges is understanding if the practice you adopted was effective and profitable. Without data, it can be hard to answer those questions. With data, you can usually tell if there was a benefit and what the payback was.

Q: Other countries (in Europe, for example) are tightening restrictions on what, how much and when products can be applied to a field. What's your sense of how that might change in North America?

A: Regulations will likely restrict and drive more decisions here, but I like to think about us making decisions based on what drives yields, rather than being forced to adopt something. For example, in some countries in Europe, there are strict limits on how much nitrogen can be applied to a field. With technologies like crop sensors I apply my normal amount of nitrogen (sometimes less), but apply it at different rates across the field, so the nitrogen use is more effective.

Q: Do you see record keeping to appease rules and regulations becoming even more work for growers in the future?

A: No. Maintaining the data is easy. As technology continues to improve more functions will be streamlined, so in that sense, some tasks will be easier. But record keeping is really about organizing information and precision farming data is another layer of information that has answers for us. There is always going to be some amount of work we will need to put into this in order to find our answers to our questions. Soils and plants are complex, thus we have to do our homework in order to understand some of our common questions.

Q: You focus so much on using field data to help make smart decisions. Is there such a thing as too much information in farming?

A: Not really. It's more of a problem of not being able to systematically work through a process to glean answers from the data. The problem isn't the amount of data, it is the ability to work through it by asking the right questions that the data can help provide answers for.

Q: So, how do growers focus in on things that can improve their operation the most? Where should they start?

A: They should start with common questions that they struggle with during a growing season. Make a list of ten things that limited yield last season. Then put a plan together to address the questions they have some control over. It's all about asking the right questions.

Q: What tools do you need to start asking the right questions?

A: I like to use many sources but they mainly fit into three categories. Data – your local data from precision displays. Key resources – these are people that I consider part of my team, like my consultant, seed, chemical and fertilizer dealers. Outside sources – these are universities, magazines, blogs, etc. But the most important thing in my experience is in-field information – observing the crop through the year and then recording your thoughts. It's a simple, yet critical place to begin.

Q: With so many factors changing so often - new seed hybrids are unveiled every year, for example - is there ever a final answer or agricultural utopia?

A: Nope, just the drive to continually get better. This is a life-long process.

Q: Give us some examples of things you have seen, questions you've asked and changes you made that were significant to your operation?

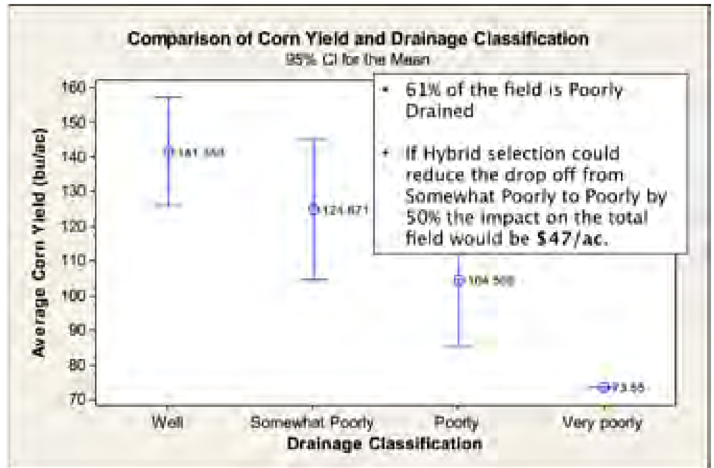
A: Nitrogen management and the type and timing of tillage are two things that we have seen significant yield boosts from on our farm the last 5 years. Even those started with simple questions that I asked myself after observing my fields – like "does it make sense to apply the same amount of nitrogen across my entire field?"

Q: How does precision software play a role?

A: Two ways. 1. It helps control the products we apply. 2. It records the information and data allowing us to ask questions from it later when questions arise. Like how much did this yield compared to another practice we tried?

Q: What should someone look for before investing in precision farming software?

A: Support. In some senses technology doesn't make it simplier, it makes us better at what we do. No matter what software you use, you're never going to be able to just fire



By looking at your yield map and comparing it to your soil map, you can start to ask questions like "is poor drainage impacting my yield?" In this case, a minor change in hybrid selection would have increased yield by $47 per acre.

up the computer and know how to find all the answers. Working with people who are dedicated to precision farming as their main line of business is a wise approach.

Q: Based on your experience, what questions should growers be asking as they go into application season?

A: What do I want to improve this year?

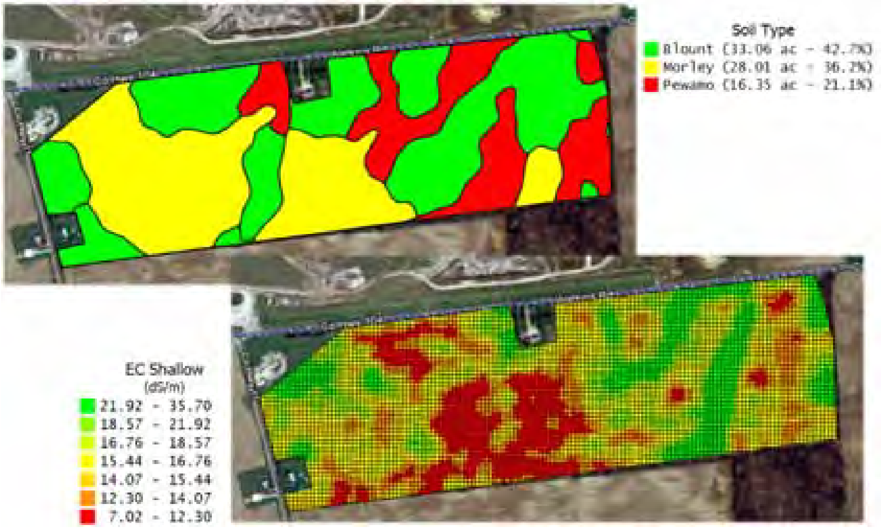
How am I going to measure improvement? What needs to be recorded for me to quantify?

Who can I ask for help for evaluating and finding out more about this topic? Are there others that have done this regionally and locally?

Q: Any advice for the grower just starting to use data to make decisions about their operation?

A: Don't be afraid of questions and not being able to answer them right away. Look at your own data, run on-farm tests, ask others, be a seeker of information to help answer your questions.

The yield map shows widely varying yield across the field – all planted with the same hybrid. Is this due to hybrid selection? Soil type? Drainage issues? Something else?

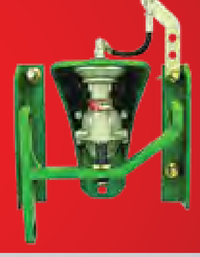


To view grower perspectives on using SMS Software, visit the Ag Leader You Tube channel: Youtube.com/AgLeaderTechnology

Whack Away

At Planting Challenges

With Hydraulic Down Force



The Down Force Actuator from Dawn Equipment is the heart of the new Hydraulic Down Force system from Ag Leader.

If you're in farming, avoiding excessive soil compaction when planting is a lot like playing that Whack-A-Mole arcade game. Changing soil types. Field terrain. Residue cover. Moisture variation. Each popping up as you cross the field – sometimes disappearing and reappearing again before you've even had a chance to address them once. Compared to other, more controllable factors like planting speed and seed population, avoiding excessive soil compaction can be a very challenging factor to manage throughout the entire planting process.

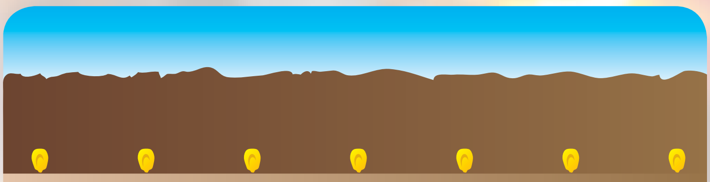
The Problem?

Excessive soil compaction can cost you at harvest time. Lodging. Root development. Varying plant emergence. Lack of soil moisture. Even the complete lack of emergence. All of these problems can result from improper or inconsistent planting depth.

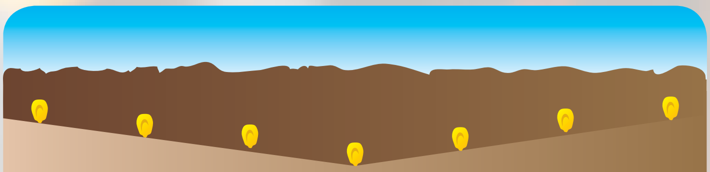
In recent years, there has been a greater focus on monitoring and managing planter down force. In most cases, this is done by measuring and adjusting the amount of force on the planter's gauge wheels. Too much force on the gauge wheels can lead to compaction problems. No force on the gauge wheels indicates you may be planting too shallow – which means seed may lack enough soil coverage or moisture to even germinate.

Managing Down Force Pays

Does managing down force pay? In short, yes. Controlling planter down force has proven to improve yield in a number of field tests over recent years. In fact, in field tests conducted by Beck's Hybrids, they estimated that planting with improper down force can result in $32 to $52 per acre in lost yield, proving that investing in a system that can provide accurate depth control is economically wise.



Ag Leader's hydraulic system adjusts pressure instantly in changing soil types without the inconsistency created by pneumatic systems that respond over a longer period of time (and land).



In the worst-case scenario, it could take a pneumatic system up to 20 seconds to inflate enough to create the proper down force, compared to one second with Ag Leader's hydraulic down force system. The difference? A quarter acre using a 24-row planter.

Originally, down force was supplied by springs on individual row units. While better than no down force, springs struggle to maintain a consistent force and are difficult and time-consuming to adjust.

In recent years, planter down force systems have gotten more sophisticated. Today, pneumatic – or "air bag" – systems have become popular because you can adjust force on-the-go. When added to the planter, they can adjust down force accordingly based on field conditions pre-set and monitored from the cab. These systems require an air compressor powered by the tractor's hydraulic system. The compressor continually inflates/deflates the air bags across the planter as it calculates down force.

While definitely providing a better seed environment than non-automated systems, the pneumatic systems can struggle to keep up, sometimes taking 15–20 seconds to completely respond to different soil or field conditions. This is because of the time it takes to inflate or deflate the air bags to match the field conditions. Across a field with varying soil types, the air bag systems may continually be playing "catch up," causing inconsistent seed depth or unnecessary soil compaction as the air bags continually try to match the changing field terrain.

The New Choice for Down Force: Hydraulic

One option for down force that solves some of these problems is the new Hydraulic Down Force system from Ag Leader. Using a hydraulically powered actuator as the heart of the system, it offers all of the benefits of the pneumatic system – without the biggest drawbacks.

Because the system is hydraulically powered, it responds almost instantly to changing requirements to maintain proper down force. In fact, where the pneumatic systems can take up to 20 seconds to fully inflate or deflate in responding to drastically different soil conditions, the hydraulic system responds in less than two seconds. Considering the amount of ground a large frame planter can cover in a half-minute, this benefit alone can be significant.

Additionally, the system, while hydraulically-driven, actually requires less hydraulic flow from the tractor compared to hydraulic powered air compressors on the pneumatic system. Consider the fact that the Ag Leader Hydraulic Down Force system doesn't require an air compressor requiring constant maintenance, the decision for those who want better control of planting depth with down force is a simple one.

Where the Grass is Always Greener

As a new generation takes over grass seed and mint production on this Oregon farm, Ag Leader takes center stage.

If you've ever reseeded part of your lawn to Kentucky bluegrass or enjoyed the taste of peppermint candy, you can thank farmers like Matt Insko and a few of his neighbors in the Grande Ronde Valley near La Grande, Oregon. In this case, however, Ag Leader had a little something to do with it, as well.

With nearly 1,900 acres under irrigation, Insko and his wife, Melanie, manage a diversified operation that includes a wide variety of unusual crops, including bluegrass and fescue for seed, peppermint for oil, hard red winter wheat and alfalfa. All fit together in a rotation program that Insko describes as best meeting industry requirements and the current weed pressure.

"When you grow certified seed, the field has to be out of production for at least three years," he explains. "That applies whether you're switching from bluegrass to fescue or switching from one bluegrass variety to anther.

"So typically, we will grow a grass variety for about five years and then roto-till the sod out and sow wheat into the field for at least one year — some guys go two years," he relates. "After that, we would normally go to mint, since peppermint is a perennial that will last for four to five years."

Once mint has run its course, Insko will go with another year of wheat and then return to grass seed. The choice at that point depends on weed pressure and the budget — as fescue can tolerate more chemicals, while bluegrass is worth more per acre.

"Where the alfalfa fits in is we're starting to use that in place of mint in the rotation," he explains. "Since mint is so water intensive, we can only use it on so many fields each year. And alfalfa is still a good cash crop, especially if we can make dairy quality hay."

The irony is that Insko's operation is actually a blend of old and new when it comes to age, experience and technology. Matt says he got his start on the Northeast Oregon farm after graduating from the University of Idaho in 1998 with a degree in agriculture.

"I was actually looking at a job with Farm Credit when I heard that John Cuthbert, who operated this place as Sand Ridge Farms, had a job opportunity," he explains. "So I started here as his foreman with the idea that I would lease land from him as he phased out of the business.

"I think we're raising more alfalfa than John was; but otherwise, we're pretty much raising the same crops," Insko adds, noting that he still draws on his landlord's experience and advice as a mentor.

Where they differ the most, however, is in the use of technology. The biggest example is Insko's use of Ag Leader products for sprayer control and auto guidance on his tractors and windrowers.

"As you can imagine with all our specialized crops, we do a lot of spraying ... putting down everything from soil sterilants to herbicides and fungicides," Insko relates. "Even the wheat generally has to be sprayed with a herbicide; and where we irrigate, we'll often put down a fungicide, as well."

Of course, the grass and mint require even more trips before, during and after the growing season.

"At least 1,200 of those acres, I'll be spraying two to three times," he continues, noting that he still uses a pull-type sprayer. "I imagine that I will eventually go to a self-propelled machine; but for right now, it's been more cost-effective to stay with my pull-type."

Insko says that has been particularly true since he installed an Ag Leader DirectCommand™ controller on the sprayer that works in conjunction with an INTEGRA™ monitor that is mounted in the cab of a John Deere 7800 tractor. However, his Ag Leader arsenal also includes two VERSA™ monitors and three ParaDyme™ automated steering systems that he moves around between a total of four John Deere wheel tractors, a Challenger track tractor and two MacDon windrowers for steer-by-wire accuracy.

Both VERSA systems utilize the WAAS signal, while the INTEGRA is set up for RTK.

"I like how easy it is to move the Ag Leader components between different tractors or swathers," he relates. "That was an important consideration when I bought the system."

Insko says his biggest challenge — and another reason for turning to Ag Leader — is the small size of his fields and the state highway that cuts through the farm at an angle.

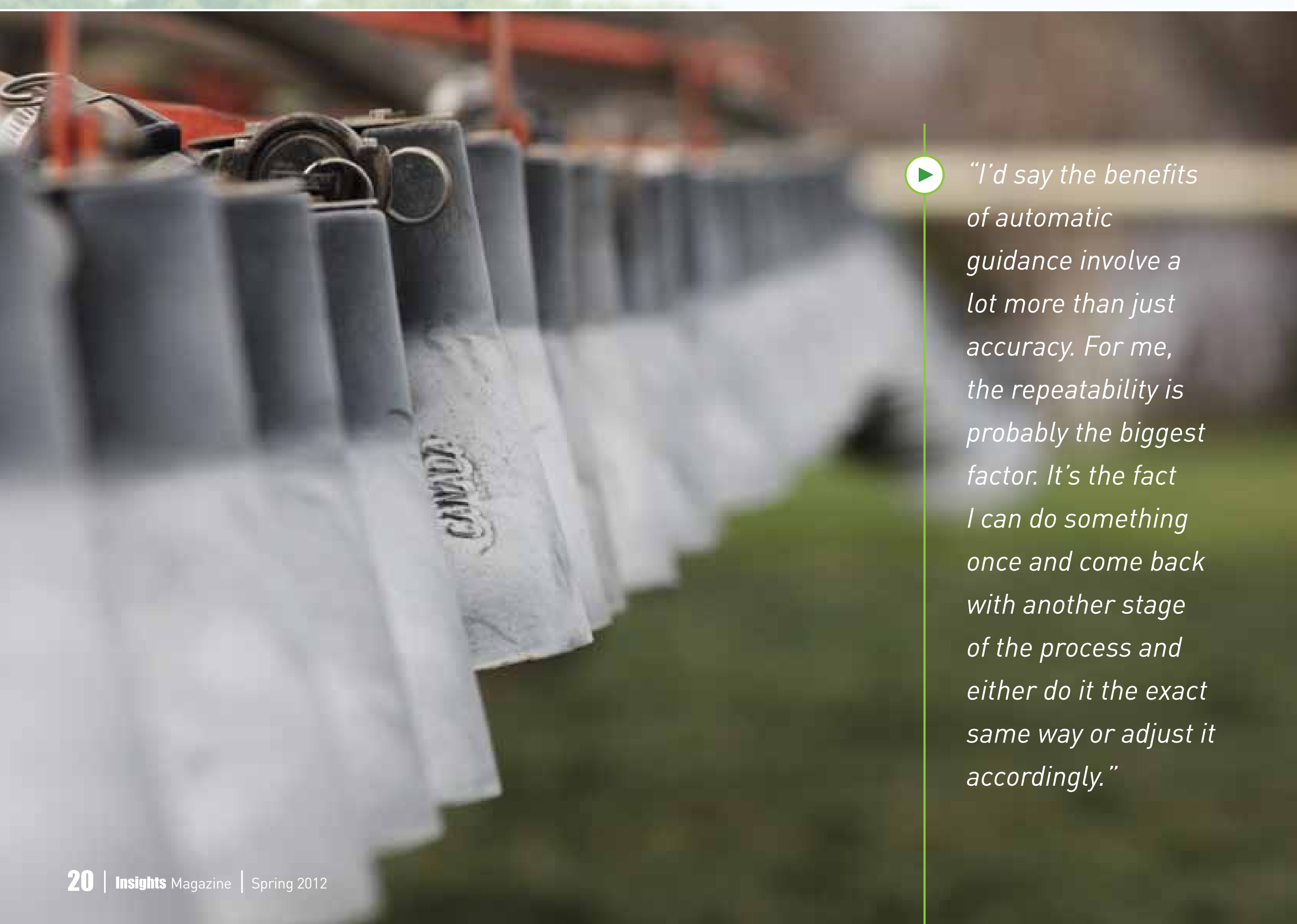
"Our average field is only 40 to 80 acres in size," he explains. "So we have a lot of fields that come to a point, especially where they border the highway."

That's also the reason the 84-foot boom on his sprayer is split into nine sections for automatic shutoff.

"The reason I went with so many sections is that with all my angled fields, the more sections you can afford to split it into, the better off you are in terms of chemical savings.

"Now, when I come up to a point on a field, it'll just go 'boom, boom, boom' and kick them off as I get there; then turn them back on after I turn around," he continues. "All I have to do is sit there and drive. The other thing I like about it is I can adjust the 'look ahead' time to add a second or two for the boom to build up pressure before I hit the part of the field that hasn't been sprayed.

"I don't know how much DirectCommand saves me altogether, but I know my chemical bill for just one year is over $100,000. But that includes custom work. So I'm sure my payback will be less than three years."



"I'd say the benefits of automatic guidance involve a lot more than just accuracy. For me, the repeatability is probably the biggest factor. It's the fact I can do something once and come back with another stage of the process and either do it the exact same way or adjust it accordingly."

Insko says that doesn't include the benefits that are hard to put a price on, like reduced fatigue and the ability to spray at night.

"There have been times that if I hadn't been able to spray after dark, it wouldn't have gotten it done in time, due to a change in the weather," he relates. "The other thing is the soil sterilant, which we have to put down ahead of the mint, can build up in the soil. So if we overlap too much with that, it can cause problems with later crops."

Because Insko has seven center-pivot irrigation systems that supplement the existing hand line and wheel line irrigation systems, he also appreciates the fact that the VERSA and INTEGRA monitors incorporate a pivot mode.

"That was one of the features we really liked about it," he says. "But I like the way it cuts down on the overlap, regardless of what pattern we're using. With the crops we have, we tend to do a lot of tillage between crops, even though the crops themselves may be long-term. After we take a field out of production, we'll plow or disk it, roll it a time or two, harrow it, etc.

"At the same time, we like to work the field at an angle after we've plowed or disked it, just to level it up a little more," he continues. "So another nice thing about the Ag Leader system is I can punch in an angle ... say 196 or 208 degrees, and work off of that on the first pass. You don't have to set a new A-B line at an angle."

Insko says the auto-guide system has also been invaluable when it's been necessary to replant grass seed.

"Regulations state that if you have to replant a grass seed crop for any reason, you have to plant it in the same row or at an angle to the original rows," he says, noting that grass seed is planted in 15-inch rows. "It can't be replanted between the rows. Well, with the accuracy of the RTK system that I have on my sprayer tractor, I can reseed right on top of the old rows.

"On the other hand, I'd say the benefits of automatic guidance involve a lot more than just accuracy," he concludes. "For me, the repeatability is probably the biggest factor. It's the fact I can do something once and come back with another stage of the process and either do it the exact same way or adjust it accordingly. I know my landlord has certainly been impressed; and he's been in this business a lot longer than I have."

"I like how easy it is to move the Ag Leader components between different tractors or swathers, that was an important consideration when I bought the system."

Investing in the Future of Precision Agriculture

Imagine learning how to design a website … on a typewriter. Indeed, some skills are difficult enough to learn under ideal circumstances, let alone with antiquated technology. Unfortunately, it's the situation many young growers face today. Without access to innovative farming equipment and technologies, their ability to acquire advanced skills and knowledge is limited.

Iowa State University is on a mission to ensure agricultural students are sufficiently prepared for the future opportunities and challenges in farming. With the addition of a new $60.4 million state-of-the-art Biorenewables Complex, students in the Department of Agricultural and Biosystems Engineering (ABE) will have access to the cutting-edge technology they need to master advanced precision agriculture skills.

Ag Leader proudly donated $250,000 to this building project, which will also provide new classrooms and lab space for the ABE department. Kurt Larsen, an Iowa State University student who will join the Ag Leader team fulltime after graduating in May, said the construction of the new Biorenewables Complex is a major step forward for precision agriculture, as it will help students gain valuable experience that they can apply back on their own farms or use to demonstrate professional value to potential employers.

"Some students may not have precision agriculture equipment on their farms, so facilities like the Ag Leader Precision Farming Systems Lab give hands-on experience with this technology," said Larsen. "This allows students to gain skills and knowledge employers are looking for and they can take back home to the family farm."

Kaleb Lindquist, who is also poised to join the Ag Leader team fulltime after graduating from Iowa State in May, said the new facilities will prove instrumental in advancing the precision ag industry, while also solidifying Iowa State's reputation as a leader in agricultural education.

"It's not only a monumental step forward for the (Department of Agricultural and Biosystems Engineering), but for the university as a whole," Lindquist said. "These new facilities will help to draw in prospective students and will be the grounds for the future industry leaders to become versed in this ever-changing industry."

Ag Leader President Al Myers said it was a simple decision to donate to this building project, which is scheduled to be completed in the summer of 2014, since Iowa State University shares Ag Leader's mission to advance the precision ag industry through education and innovation.

"Our industry is only as good as the people working in it, and I can't think of a better way to ensure future innovations than to support the education of individuals who'll be making them," said Myers.

"Our industry is only as good as the people working in it, and I can't think of a better way to ensure future innovations than to support the education of individuals who'll be making them." – Al Myers.

Groundbreaking Ceremony September 30, 2011

OptRx Crop Sensing Adds Rate Table Feature: Smart Application Gets Even Smarter

Technology is a funny thing. People often discover other uses for a new technology before it has even been adopted by the masses for its original purpose. This is exactly what is happening with OptRx™ crop sensing technology from Ag Leader. While the technology was initially introduced as a way to analyze corn and wheat crops on-the-fly, determine nitrogen fertilizer needs and apply variable rates based on real-time crop and field data, innovative growers and agronomists are finding other ways to use the technology across a number of different types of crops and using a variety of different application products.

Enter a new technology, called Crop Sensor Rate Tables, a new feature within the INTEGRA display that allows a producer, using OptRx crop sensing to apply agrochemicals – any agrochemicals – on-the-go at rates necessary for optimum crop performance.

"Many agrochemicals, such as fertilizers, pesticides, defoliants, growth regulators and others can be more effectively applied if the rates are varied according to crop health," said Chad Fick, product specialist at Ag Leader. "There are an unlimited number of ways in which a user, while working with an agronomist, could put the rate table to use in their own operation."

For example, cotton growers attempting to improve efficiency with the amount of defoliant they apply can use OptRx crop sensors with the Rate Table to apply more defoliant on healthier plants and reduce the amount applied on weaker plants. This improves application efficiency by potentially reducing the number of trips across the field, at the same time, saving on input costs.

Potato and soybean growers are also working with agronomists to investigate ways to improve fungicide applications by varying the rate applied to the crops. The goal: to increase the effectiveness of the applied fungicide without increasing the amount applied.

Vegetable growers are also adapting OptRx with its rate tables to improve pesticide applications based on real-time field data.

Of course, those who have already adopted OptRx for use in corn or wheat now have the capability to use the Rate Table feature for the application of other products besides nitrogen fertilizer as well.

"When Ag Leader began providing crop sensors a few years ago, Al Myers (Ag Leader founder) stated that he saw crop sensors as a future technology that is in the same place as yield monitors were in 1992," said Fick. "Much like in the years following the introduction of yield monitors, many growers are integrating this new technology and could not see future farming without it."

To learn more about OptRx™, visit DiscoverOptRx.com/TellMeMore.

6 Things You Should Know About the Nitrogen in Your Field

1. Denitrification is a ruthless thief. Waterlogged soils undergoing denitrification lose up to 5 percent of available nitrogen per day. This means a soil with 150 pounds per acre of plant-available nitrogen can lose 75 pounds of nitrogen per acre in just 10 days.

2. Organic matter matters. Most fields have soil color variation. Color indicates different levels of organic matter; the darker the soil, the more organic matter. Organic matter provides soil its own source of nitrogen. On average, every 1 percent of organic matter produces 30 lbs of nitrogen per acre. Any field with organic matter variation requires a varied rate of nitrogen. Think about this: you must apply 120 lbs more nitrogen per acre on lighter colored 2 percent organic matter soil to make up for the extra nitrogen produced in the darker 6 percent organic matter soil.

3. The early bird wastes the worm. Applying your fall or spring applications too early means much of the nitrogen is already gone before your plants can use it. Corn consumes 80 percent of its nitrogen after the V12 growth stage. For wheat, 75% of nitrogen is taken up once it begins stem elongation. Applying nitrogen just prior to these stages is the most effective timing for the crop.

4. The Right Stuff. Applying the right amount of nitrogen in deficient areas can yield a 4-to-1 return against the cost of extra nitrogen applied. And using the optimum amount of nitrogen at all times in corn and wheat production has been proven to yield $15-$30* extra per acre on average in field tests.

5. Too much of a good thing. Blanket application can mean too much nitrogen is applied in some areas of your field. This can be harmful to your plants and cause serious environmental damage. More importantly, the over-application eats into your profits.

6. No need to guess. Growers seeking a cutting-edge solution to nitrogen variability are turning to crop sensing technologies like OptRx™ from Ag Leader. Real-time sensing lets you adjust application rates on the fly, ensuring the optimum amount of nitrogen is being dispensed at all times. This eliminates waste, increases yield potential and maximizes profits.

Ag Leader® Technology

To learn more about precision nitrogen application using OptRx crop sensors, visit www.DiscoverOptRx.com/TellMeMore.

* Individual results may vary. Profits per acre based on average corn/wheat yields (at $3.50/$5.50 per bushel respectively) and nitrogen costs (at $0.60/$0.50 per lb respectively) observed in field tests where OptRx crop sensors were used to apply nitrogen at varying rates to the corn/wheat based on crop vigor, versus strips where OptRx sensors were not used and nitrogen was uniformly applied based on the grower's own recommendations.

How OptRx™ Works

OptRx crop sensors shine light on plants and read subtle changes in light reflectance to determine crop vigor. By identifying the plant health of the crops, OptRx determines the amount of nitrogen plants with lower crop health need.

Plant health is established in real time by reading two things. First, sensors measure the mass of vegetation using near infra-red light reflectance. The sensors then read the reflectance of visible light in plants to detect the amount of nitrogen present.

Together these two factors create a vegetation index – an overall measurement of crop vigor – as the applicator passes over plants in real time. OptRx averages the readings from multiple sensors installed across the boom and recommends the amount of nitrogen that should be applied, relaying this information to the cab monitor so application rates can be adjusted on the fly.

By applying more nitrogen in lower performing areas and less in higher performing areas, growers can maintain a uniform, consistent nitrogen-rich soil base across the field through the key parts of the growing season. **Improved crop health from proper nitrogen application leads to increased yield potential.**