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OPINION:

The Agricultural Drone War Is Over, And They Lost

March 15, 2017

Ben D. Johnson

If you are late to the aerial imagery party and think that agricultural drones are the vehicle that are the be all, end all answer to your imagery needs, you are going to lose and lose big at that. But before we get into that, let's take a trip back down memory lane to the spring of 2014. It seemed like everyone and their brother was taking to the skies for the first time with their brand new drone. It was the hot trend and dozens of companies emerged seemingly overnight that built and sold drones.

In fact, I remember attending a drone field day in Decatur, IL, that hosted dozens of companies and their drones with hundreds of other ag professionals like myself in attendance. The drones demonstrated that day ranged from just barely a step up from being homemade, all the way up to military grade. Some systems seemed very sophisticated and others less so. It was a very interesting event and it seemed like the future of drones was very bright.

Fast forward three years and only two or three of those companies from that event are still players in the drone business. The drone companies today seem to do a pretty fantastic job of delivering aerial imagery via a drone and use equally fantastic software to stitch it all together into something actionable by the grower. However, despite all of this great technology, there are some pretty big limitations in converting this great technology into a successful commercial agricultural drone program.

First, let's recognize that the im-

portant information collected by aerial imagery is NDVI imagery. This is important so we can detect issues out in the field before they are visible with the naked eye so we can in turn correct the issues out in the field while minimizing the yield loss, and ideally maximizing our profit potential. With this in mind, the ultimate goal of collecting NDVI imagery is to collect it at the correct time and turn it around into data that is actionable out in the field as quickly as possible.

With drones, there are some severe limitations in achieving these goals at a level that can be scaled into a successful business model, so let's explore some of these issues:

Licensing

There are now laws in place that require you to have a license if you are going to fly a drone for commercial use. While it is not necessarily difficult to obtain your license, there are several steps to take and a few hoops to jump through to get licensed from the FAA. This licensing is a really good thing since it educates drone operators on important issues such as airspace, flying within line of sight (unless you have obtained a waiver), and other topics that ensure safe flying habits. However, the drawback of this is that if you have zero aeronautical knowledge going into the test your only chance of passing is by taking a two-day prep course. While this isn't that big of an issue and there are some terrific courses out there, it is still two days of your time.

Logistics and Time

There are also only so many flyable days per year, particularly during the

window where the data we collect can be turned around into actionable data. I live in Illinois and I always seem to be pushing weather conditions in one way or another, whether it is the high winds that are common in Illinois or patchy cloud cover that casts uneven lighting over fields. These issues can be amplified when you consider the time it takes to travel to each field, the distance between fields, the amount of acres that need to be covered to turn a profit, and the fact that we all have responsibilities far beyond operating a drone in the field. With these in mind, the window to collect data via a drone is limited. When you consider where the grain markets are at today, it becomes a real challenge to provide this service at an affordable cost to the grower.

Crashes

Another key point is that drones tend to crash. Some models and/or operators tend to have crashes more than others, but if you're reading this and you've flown a drone, you know darn well that you've crashed it at one point or another whether you will admit it or not. I myself have spent many days walking through pollinating cornfields on hot summer days looking for my downed drones. The word miserable doesn't even begin to describe those experiences.

At this point in time I can safely say that the fad of "Hey everybody, look at this cool tech I have! I'm not really sure if I'm adding that much value to the actual bottom line, but it's just so COOL!" has run its course. Now that this novelty has worn off, we have to get down to brass tacks by collecting and analyzing actionable NDVI

imagery in a high volume, low cost way to the grower. With this in mind, collecting NDVI imagery with a drone is the equivalent of bringing a knife to a gun fight, so let's talk about the other vehicles for collecting this imagery.

Airplanes

Airplanes have a few distinct advantages over drones. First, they can legally operate over 400 feet meaning that they typically don't have to make multiple swaths over a field to collect an image. Second, the flight time on an airplane is much longer than most drones out there today. With those two factors alone, airplanes can simply cover exponentially more acres in a day than a drone can. The drawback is that you do need a plane and a pilot, but there are many companies that can provide both of these.

Satellites

Satellites are useful but have many limitations as well. If it's cloudy every 10-16 days when the satellite gets in position in its orbit to take pictures of

your field, then you are out of luck for that round. The imagery isn't as high of quality as the imagery collected from drones or airplanes, but it can be useful for general observations on a whole field level. Exciting things are happening in the aerospace industry right now and new companies like SpaceX, Virgin Galactic, and Blue Origin are driving the price of launching rockets into space down significantly by creating rockets that can be reused multiple times. This ultimately means that a larger number of newer satellites could be put into orbit in a shorter period of time that could provide more opportunities to take higher quality imagery. While this could take time to become a reality, it does make the future of satellite imagery seem promising.

Don't get me wrong, I don't want to sound like a complete drone hater; I just think they have their place as a tool to take RGB photographs of issues that we can't necessarily see from the ground and need to look at right away. But to get real, actionable NDVI data during the decision making window at

an economical cost, drones are not an ideal vehicle at this point in time. I can see a very valid argument for using drones in high dollar specialty crops; but with the depressed grain markets of today, it is really difficult to scale a drone program in the Midwest.

Maybe one day drones will make a comeback. I mean the technology is certainly there to do some interesting things, but the legislative piece will make that very difficult for the foreseeable future. For now, we need to be realistic about how we collect NDVI aerial imagery in a time and cost effective manner, and drones just aren't the answer.

As for me, I'm taking a systems approach this year by incorporating drones, planes, and satellites into my aerial imagery program by utilizing the strengths of each platform. With that being said, I will be flying a drone this year but it will be a very small part of my overall aerial imagery program and it will be used solely for RGB images.

Top 10 Most Intriguing Technologies in Agriculture

June 3, 2017

Matthew J. Grassi | Paul Schrimpf

This may be a bit of stating the obvious here, but we'll throw it out there anyways: as much as some of us may fight it, we journalists are unequivocal #List Nerds.

Listicles, Top 10s, "Best-Ofs". Websites like BuzzFeed and Huffington Post basically made the leap to mainstream media status all on the strength of their respective Listicle format. No matter what you call them, we writers love brainstorming them, arguing over what to include and what to leave out, and then seeing how they are received by the ultimate target audience for these lists: you, the reader.

So why do a "Top 10 Most Intriguing Technologies for Precision Agriculture" listicle? Well, beyond the fact that it was damn good fun putting it together, we hear time and time again that many of the technologies featured in the pages of our publications don't fully deliver once deployed in the field. So this is our attempt to say, "Hey, here's what we are hearing actually works!"

1. See & Spray Technology and Machine Learning

Many of the "cool" new technologies being made available to agriculture have a hard time finding practical applications that add value. On its face, machine learning — the ability of a computer to accumulate knowledge about an action or a thing and begin to "make decisions" on its own — would have broad applications in ag. And it could; but the devil is in the details. Tasks that seem relatively simple often end up having multiple layers that add complexity in a hurry.

With its See & Spray technology, startup tech company Blue River started

by identifying a singular issue of great concern — herbicide-resistant Palmer amaranth — and developed a machine that can "learn" to identify and spray Palmer on the go utilizing machine learning. In testing mode in the Southeastern U.S. this year, it is scheduled to move to production in 2018.

2. Internet of Things

The term the Internet of Things (IoT) has a very Silicone-Valley vibe, but its potential benefit to agriculture should be clear. Essentially, it's connecting all the disparate devices we use in the field to monitor and measure the work we do, and making the information they provide fully accessible.

We're already using it. We monitor fuel tank levels, soil moisture, water meters, rainfall, weather stations, irrigation pumps, and cattle biometrics today, and access the information from smart phones. "These new technologies can already help improve operational planning and accelerate decision making on farms, large and small," says Paul Welbig, Director of Business Development in Agriculture at Senet. As more solutions are built and deployed, there's no doubt we'll see even more advantages develop from the IoT in agriculture.

"IoT has the potential of connecting literally billions of devices and 'things' in agriculture that never had a voice before because they were typically too costly to do so," he continues. "Now, with the advent of low power, wide-area networks, low-cost modules, and longer battery lives, we can affordably connect soil, water, plants, animals, machines, and any other objects that could provide us with valuable data insights."

3. Irrigation Control

When it comes to employing technology that improves control and

efficiency, irrigation is arguably the farthest along in the ag industry. Systems that serve up status reports on pivot performance, soil moisture sensing, weather, and other field data to mobile phones and computers are commonplace, and providing end-users with on-the-go tools to make and implement irrigation management decisions.

And the future is even brighter for irrigation control. Manufacturers such as Valley and Lindsay are working on building connectivity with other types of field sensors to help end-users make more comprehensive agronomic decisions, says Nebraska farmer and irrigation expert Roric Paulman. "The fact that these manufacturers are willing to open up and be connected is really big news for agriculture," Paulman says that much more is in the works that will provide information to end-users that will improve decision making both from an irrigation standpoint, as well as overall agronomy.

4. Nitrogen Modeling

Fertilizer is still by far the biggest revenue generator for retail service providers — and has in recent years become arguably the most scrutinized input in agriculture. Along with a variety of stewardship initiatives have come commercial programs that monitor and improve nitrogen efficiency — programs that are really beginning to show their mettle.

As the market continues to move away from the single fertilizer application approach toward multiple in-season applications on an as-needed basis, nitrogen management solutions have evolved to help retailers make the best possible decisions about rates and timing to ensure the most efficient application is being made. Systems such as 360 Yield Center and Adapt-N are

gaining traction and providing a clear path to better nutrient efficiency.

“The pace of adoption of nitrogen management solutions are being driven by two things: validation and simplification,” says Steve Sibulkin, CEP of Agronomic Technology Corp., which has developed Adapt-N. “Validation goes beyond, ‘does it work’ — for the grower it means improving every step of the decision making process, and for an ag retailer it must drive differential value to the core business.”

Dynamic, flexible solutions provide “actionability,” he says, allowing end-users to understand the data and make adjustments to programs and recommendations on the fly.

5. Electrical Conductivity Sensing

Measuring the Electrical Conductivity (EC) capacity of soils is becoming an increasingly important component of any precision irrigation program. By combining the data output of currently available EC sensing products like the backpack-mounted Geonics EM38-MK2 (used more prominently in permanent crop orchards) or Veris’ pull-behind Soil EC sensor with other layers like soil moisture and pH, service providers hired to optimize a growers’ water usage can show a higher level of service by using the data to make more informed decisions on watering, from both the timing and quantity aspects. (EDITOR’S NOTE 7/6/17: The Geonics Limited EM38-MK2 sensor is also sled/trailer mounted, not “backpack mounted.”)

Zabala Vineyards (Soledad, CA) is one of many wine grape growing outfits in California that deploys EC sensors throughout its vineyards to right-size irrigation scheduling. Dealing with a range of soil types from sandy to basically growing grapes in a Fred Flintstone-esque gravel pit, it’s these data layers that allow Vineyard Manager Jason Melvin to tailor his irrigation schedule to each individual wine blocks’ soil type.

“With those EM-38 EC values we like to use that to set our plant available water metrics in real-time, and we use that data to direct our soil sampling program. And all of that is used to design our irrigation system and schedules for the year,” Melvin explained during our 2017 California Ag Tech Tour.

6. Drone Developments – The Chase for 1,000

OK, so maybe drones haven’t quite taken off from an adoption standpoint in precision agriculture, YET. Let me be the first to say: Congratulations skeptics, hot takers, and grumpy naysayers in general.

Yes, it must be admitted that scaling the technology to fit (in a way that makes the most dollars and sense) into grower-facing precision services programs down at the dealership has proven quite challenging. Still, even Sally Skeptic has to admit that there have been some exciting developments in the drone space as of late.

Firstly, ag-focused drone manufacturers like AgEagle with the AgEagle RX48 (300 acre coverage on a single battery charge) senseFly with its eBee SQ (500 acres), AeroVironment’s Quantix vertical-takeoff quadcopter/ fixed wing mashup (400 acres), and Sentera’s Phoenix 2 (700+ acres) are all edging ever-closer to the coveted 1,000 acres-on-a-single-battery ceiling. Then there’s the work that Minnesota-based startup Sentera has done in making high-resolution NDVI/ NIR sensing packages available for some of the cheaper consumer-focused platforms like DJI’s uber-popular Mavic and its Phantom4 Pro flagship quadcopter.

So maybe drones haven’t set the agricultural world on fire just yet. Even though I am a commercial drone pilot myself, I have no problem making that admission. Give these companies a couple more years of R&D work, though, and those expensive flying

robots just might start covering enough ground in one flight to make service providers pull the trigger.

7. Unmanned Tech

As longtime friend to PrecisionAg® Professional Jeremy Wilson explained to me at our inaugural Vision Conference in Phoenix in October, the potential of driverless vehicle technology to completely revolutionize how business is done in this country goes far beyond just the farm gate. Advancements in this field will change the way that we live in ways that many of us have yet to fully fathom.

That day Wilson explained to me that, on average he probably spends about one to two hours per day behind the wheel commuting to various appointments and meetings in his job in Central Illinois as a Technology Specialist with Crop IMS, something he deridingly refers to as “windshield time.”

“Now, what if, instead of spending that one or two hours per day doing nothing else but staring out my windshield and paying attention to the road, I can turn that responsibility over to the computer and have that hour or two to do things that I actually need to get done for our customers, or answer emails, or even catch up on sleep, so I am more rested and better prepared to serve our customers when I arrive at my destination? Think about how much more we (as service providers) could get done if technology can remove that time we have to spend behind the wheel every day. Now THAT is truly revolutionary.”

I literally couldn’t have said it better myself, Jeremy.

8. Precision Planting’s SmartFirmer sensor

One thing many in precision ag have struggled with for years is how to collect data on what’s happening in the seed trench. One method many have used in years past was simply grabbing a flashlight and notepad, getting down on one’s hands and knees and taking visual obser-

vation notes on how moist the seed trench appeared, or how much soil organic matter one could sense with the human eye. An imperfect process that would surely suffer from subjective interpretation (ie human error) of current conditions.

Precision Planting's SmartFirmer makes collecting agronomically sound data from within the seed trench a reality, without having to get down on ones' hands and knees or even make another trip across the field, since it's integrated within the planter itself. According to Precision Planting's website, this "unprecedented sensing capability will allow farmers to not only map row-by-row organic matter, soil moisture, and furrow residue, but also to perform on-the-go control of planting population or hybrid based on organic matter measurement."

For service providers, one must consider the potential to drive new revenues by marketing seed trench sensing as an add-on to existing precision programs. Not only does it clearly demonstrate to growers a higher understanding of soil-seed interaction dynamics, it also shows customers your precision programs embrace a service-focused leadership role by implementing the latest cutting-edge data capturing technologies. It's at least worth a thought, that's all we're saying.

9. New Leader NL5000 G5

Although it debuted at the massive 2017 National Farm Machinery Show in Louisville, KY, back in February, my first look at the New Leader NL5000 G5 Dry Nutrient Applicator with Swath Width Control (jointly developed with Ag Leader) came a couple weeks later in San Antonio, TX, at the 2017 Commodity Classic. By that time, many of our trusted advisors within the industry had already called or emailed to make sure we understood just how impactful this newest New Leader innovation had the potential to be.

Basically speaking, the G5 allows applicators to achieve "pinpoint application accuracy with a spinner-spreader," and it also includes a sustainability aspect in that it helps keep dry dispersible fertilizer granules from being placed off-target, specifically in end-rows and edge-of-field areas where only one side of the spinner needs to be running.

"The G5 brings an unprecedented level of precision placement to operators, and gives them reassurance in knowing that nutrients are being placed where they need to be," said Rocki Shepard, HECO President and CEO.

If somehow you missed the New Leader NL5000 G5 on the winter equipment show circuit, take some time at MAGIE

or Farm Progress this summer to learn about the machine and its capabilities, especially if you custom apply dry fertilizer for customers.

10. Robotics

There's no shortage of speculation on how robotics could positively impact the production of food, in particular high value crops that require intensive labor to care for and harvest.

Today, with labor availability becoming a bigger concern within the commercial tree fruit industry, the interest in robotics is driving a fresh wave of interest and urgency into robotics development, says Christina Herrick, editor of American Fruit Grower magazine.

"Currently, growers have opted for labor-assist platforms to reduce the reliance on ladders and increase efficiencies," says Herrick. "Robotics, though, are being eyed as a solution to labor woes, with two robotic harvesters being developed with the hope of commercialization in the next few seasons."

First up is harvest robots for apples.

"Growing systems are typically consistent and trees are smaller, which will make it easier for autonomous harvesters to work in orchards." ■

A Right To Repair: Why Nebraska Farmers Are Taking On John Deere And Apple



March 10, 2017

By: Matt Hopkins

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Farmer and technician Kyle Schwarting, from Ceresco, NE, in the cab of his Case IH tractor. Photo credit: Olivia Solon for The Guardian.

There are corn and soy fields as far as the eye can see around Kyle Schwarting's home in Ceresco, NE, writes Olivia Solon on TheGuardian.com. The 36-year-old farmer lives on a small plot of land peppered with large agricultural machines including tractors, planters and a combine harvester.

Parked up in front of his house is a bright red 27-ton Case tractor which has tracks instead of wheels. It's worth about \$250,000, and there's a problem with it: an in-cab alarm sounds at ten-minute intervals to alert him to a faulty hydraulic connector he never needs to use.

Because farm machinery is now so high-tech, the only way to silence the error message is by plugging in a special

FARMER AND TECHNICIAN KYLE SCHWARTING, FROM CERESCO, NE, IN THE CAB OF HIS CASE IH TRACTOR. PHOTO CREDIT: OLIVIA SOLON FOR THE GUARDIAN.

diagnostic tool – essentially a computer loaded with troubleshooting software that connects to a port inside the tractor – to identify and resolve the problem. Only manufacturers and authorized dealers are allowed that tool, and they charge hundreds of dollars in call-out fees to use it. For a fifth-generation farmer in an increasingly squeezed industry, whose family has spent decades fixing the equipment they paid for, it's a tough pill to swallow. He's coped with the intermittent alarm sound for almost a year.

"I can't turn the alarm off. If I had the literature and capability to diagnose and fix it, it would already be done. I changed the mechanical switch and wire, but now I'm down to the programming," he said Wednesday.

Kyle is one of many farmers in the U.S. fighting for the right to repair their equipment. He and others are getting behind Nebraska's "Fair Repair" bill, which would require companies to provide consumers and independent repair shops access to service manuals, diagnostic tools and parts so they aren't limited to a single supplier. They have an unlikely ally: repair shops for electronic items like iPhones, tablets and laptops who struggle to find official components and information to fix broken devices. This means the bill could benefit not just farmers but anyone who owns electronic goods. There's also a benefit to the environment, as it would allow for more refurbishment and recycling instead of sending equipment to the landfill. ■

17 Field Scouting Apps For Precision Agriculture

February 6, 2017
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AGRASCOUT | NEUCADIA

AgraScout is a fast and easy-to-use crop scouting app. Draw or import fields then use Fields Nearby to start scouting. Drop disease, insect, stressor, or weed pins directly on top of where you're standing in the field. Take pictures and write comments then send scouting reports to the agronomist or grower. You can also attach product recommendations to scouting reports. Android, iPhone, and iPad

LANDSCOUT 2 | SATSHOT

Landscout 2 is a cloud-based app, built to analyze high-resolution imagery. Access your personal archive of data for scouting and reporting while you work your field. Landscout 2 is also offline-capable, meaning that once you look at a field's data, it's locally stored and viewable with no internet connection. One of Landscout's fundamental features is 'Events'. Record everything you do from planting to harvesting, as well as soil-testing and scouting. Every event is linked to your field boundary so they're always accessible for viewing, editing and PDF exports. iPad

MAVRX SCOUT | MAVRX INC.

Achieve total field awareness all season long with Mavrx Scout. Take the power of imaging and analytics to the field with automatic issue detection and prioritized alerts delivered to you and your team anytime, anywhere. With this app, you can easily prioritize fields to scout, navigate to any areas at risk, and record scouting observations with just a few clicks. Check in on your high-resolution crop performance imagery and integrated data layers online or offline. Android, iPhone and iPad

CROPTIVITY SCOUTING SOLUTION | DECISIVE FARMING

Croptivity automates the work flow between the crop scout, agronomist, applicator and grower so that crop issues are solved quickly and all data is available for full traceability on the farm. A field scout or grower can work offline with pre-populated dropdown lists and GPS observations with pictures. A designated agronomist can receive reports from multiple scouts/growers and complete recommendations in one-third of the time, resulting in more acres serviced. Android, iPhone and iPad

AGFINITI MOBILE | AG LEADER

This app for the iPad puts your data at your fingertips, making it available wherever you go. HD quality mapping, detailed summaries, and the ability to query specific locations or drawn areas on your map gives you the ultimate tool to get more out of your data. With the AgFiniti Mobile app, you can now add notes and pictures to your maps for scouting. Just tap and hold anywhere on your maps to add a text note. Easily add a picture to your notes for added detail. These notes seamlessly sync to AgFiniti Cloud with the rest of your data, so no matter where you're at, or what device you're using, you have the most up to date information. iPad

AGWORLD SCOUT | AGWORLD

Agworld Scout offers a flexible, simple and efficient way to collect your infield data on your iPad and iPhone. This farm monitoring app enables you to create and complete in-field assessments to monitor crop health, pest pressure and more. Take full control of the entire scouting experience. Create and share your templates with colleagues, collect data and report on farm scouting activities quickly and efficiently. Perform crop monitoring and bug counting tasks without the complexity of spreadsheets or the frustration of paper-based forms. iPhone and iPad

CROPRECORDS | CROPRECORDS.COM

Ideal for farmers and crop consultants, the CropRecords app is a user friendly tool for crop planning, field scouting, record keeping and report preparation. Create jobs for spraying, seeding, fieldwork, and harvesting. Track when these jobs are completed. Enter data in the field and sync to the croprecords.com servers when Internet service is available. Android, iPhone and iPad

AGRIAN MOBILE | AGRIAN INC.

Agrian Mobile was one of the first apps developed for creating GPS-based field maps, while also capturing transferable crop data and scouting reports directly from the field in real time, with offline access. Agrian introduced the app in 2009 as a mobile extension of its web-based ag data software platform. This pioneering technology provided growers, crop consultants, applicators and farm managers the ability to record field events and scouting reports, upload them to a secure, private account and then share data with appropriate partners from a wireless, mobile device. It also gives users access to the largest manufacturer-indemnified crop protection label database featuring more than 7,000 product labels. iPhone and iPad

AGWORLD SCOUT | AGWORLD

Agworld Scout is a farm monitoring application that enables you to create and complete in-field assessments to monitor crop health, pest pressure and more. Take full control of the entire scouting experience. Create and share your templates with colleagues, collect data and report on farm scouting activities quickly and efficiently. Perform crop monitoring and bug counting tasks without the complexity of spreadsheets or the frustration of paper-based forms. iPhone and iPad. ■

Agritechnica 2017: 5 Quick Takeaways from World's Top Farm Show

November 21, 2017

By Matthew J. Grassi

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Agritechnica 2017 wrapped up this past weekend, and now with the show in the books and a few days to think about/process everything seen and heard in Hannover, Germany last week, I have but one overriding thought to offer: “WHEW!”

My journey to Agritechnica 2017 was an eye-opening, perspective-changing, hopefully-not-once-in-a-lifetime opportunity, and I'd encourage anyone that's ever expressed an interest in attending the show to, in the iconic words of Nike founder Phil Knight, Just Do It.

Now, without any further ado, I present five observations from my time in Hannover amidst over half a million visitors from across the globe and 2,900 exhibitors from some 52 countries. Keep in mind that over the coming days and weeks we'll be sorting through all of the press packets and interviews to bring you even more insights from the Big Show, but this is just an initial, 30,000 feet snapshot of what's been keeping the wheels moving in this author's mind since landing back in the States.

So, please enjoy these scorching #HotTakes for what they are, and stay tuned for more (perhaps slightly less-hot) takes!

Robotics – they might be concept now, but they're coming...

There's that saying, everything that is popular in Europe takes about five years to become a trend here in the states. Yeah, that saying is probably pretty accurate here, although some of the crazy advanced robot systems on display at Agritechnica seem more like 10 or even 20 years out. Fendt/AGCO's

Project MARS small footprint, inter-connected, swarm-able field bots got a lot of play at the show, capturing a silver medal in the Innovation Award category for this year, but there were also interesting “concept” robots like Flourish, a massive automated crop scout/plant specific weed removal robot/UAV mashup that leverages ag drones in a manner unlike anything this author has ever witnessed before, and JATI, which takes the Blue River “Sense & Spray” concept to a whole another level by replacing the crop protection nozzles with high-intensity laser beams that vaporize weeds when they are very tiny. I believe it was Austin Powers' nemesis Doctor Evil who requested “sharks with frickin' laser beams on their heads” back in the 90s, not sure he ever thought about sprayers with frickin laser beams! Some “evil genius” that dude was!

Europe Entering What One Farmer Called the ‘Era of the Advisor’: One area that Europe is actually following on the U.S. and Canada's heels remains its farmers growing embrace of ag service professionals, something we've (*cough *cough) been advocating stateside for years now. There are also some companies with intriguing offerings coming online that could eventually disrupt the ag service provider in Europe, such as xarvio with its free smartphone-based agronomic scouting tool, as well as Climate Corps. announced foray into the European market. The xarvio scouting app looks especially intriguing in that it is free and provides real-time crop diagnosis information in the time it takes to shoot and submit a picture from your mobile phone. It also bears noting that the digital farming portfolio the recently-acquired-by-Bayer company is putting together looks VERY promising with Bosch's Smart Spraying tech, Planet

Lab's high frequency satellite imagery, and its proprietary Field Manager FMIS app rounding out an impressive initial digital offering. Although at the moment specific crop protection product recommendations aren't being made via xarvio, anyone that's been in this business for any amount of time can see the writing on the wall. xarvio representatives on hand in Hannover were vague on when xarvio will make it's North American debut, saying a U.S. release won't be happening until mid-2018 at the earliest. Is xarvio singlehandedly going to take over the world of Ag Tech, one farmer-submitted smartphone image at a time? And when Bayer brings its shiny new toy stateside, how will it play with already established domestic players like Climate and Farmers Edge, or even the independent agronomist making a living identifying and troubleshooting the very problems xarvio is looking to automate? I unfortunately don't know the answer to these questions (*DUCKS), but it's going to be damn fun to watch it all play out...

An ISOBUS Driven World: A lot of solutions around ISOBUS were presented at the show, such as German FMIS outfit 365FarmNet.com's new dongle, which is similar to the Farmobile PUC in that it allows various different data sources from mixed-fleets to be collected, normalized and analyzed within the 365FarmNet system. 365FarmNet.com had a busy week, also announcing adoption of the AgGateway ADAPT data standard, as well as cross-compliance reporting with YARA, both of which will help its users streamline the documentation/track and trace processes becoming more and more implicit in producing edible crops for human consumption in 2018. After taking all of this into account, it's clear that how European ag tech outfits and



equipment manufacturers have embraced the ISOBUS standard has significantly accelerated the adoption and ease-of-use in using spatial data analysis tools across the pond. Perhaps soon President Trump can tweet out some encouragement for our U.S. brethren to just get it over with and fully embrace ISOBUS standards at the OEM level? SAD!

Adoption Driven Bottom Up in Europe: Unlike here in the states, where the threat of not having enough production data to appease the holder of your grain marketing contract is often enough to scare data-wary growers into adopting whatever technology is needed to capture and collect the required data layers, I was surprised to learn that the major food processors (think the Cargills and Walmarts and General Mills of the world) in Europe and other parts of the world aren't a part of the process yet in driving ag tech adoption rates. Indeed, in such a hyper-competitive market, it is return-on-investment at the grower level, as well as just a need to be as efficient as humanly possible at all times in order to stay sustainable, that

drives ag tech adoption in Europe. And, according to survey results disseminated among the ag media by conference organizer DLG, those looking to market ag tech solutions to European growers should have a healthy outlook going into 2018 as DLG reports that between 35-50% of farmers are open to ag tech investment in the next 12 months, and two-thirds of European farmers see ag tech investment as an opportunity, versus the one-third that see it as a risk.

Non-Chemical Weed Control Technologies Are Pretty Sweet: With all the challenges the industry faces in finding new chemical weed control solutions, it's pretty refreshing to see some companies really thinking outside of the box on how we can leverage advanced technologies like sensors and edge computing to help farmers reduce their reliance on pesticides while still maintaining weed free fields. I think this summer's dicamba disaster in the Mid-South clearly demonstrates a need in the coming future for alternatives to intensive herbicide application, just like we've evolved from broadcast fertilizer

application to more site-specific, variable rating of crop nutrients. Sure, right this minute it's a lot of pie in the sky stuff, but if things like Bosch's Smart Spray sensor-based application system (eerily similar to Blue River's See & Spray), or the crazy German-engineered field work rig in the Innovations area that variable-applies a mechanical hoe in-furrow while also variable spraying herbicide between the rows, all based on real-time weed sensing information driven by machine learning, become common place, I'd argue it's a better story for those of us in production agriculture, as well as concerned consumers. ■

Imagery: Show Me the Money

August 2, 2017

By: Lisa Prassack

As you have seen throughout this report, aerial imagery has been a “thing” in agriculture for decades. Systems and delivery mechanisms have come, gone, and evolved. New satellite deployment for image capture has exploded in recent years, while the resolution and “on-demand” capability of drone systems have grabbed much of the current spotlight. Finally, there has been an earnest re-focus on imagery collected via manned airplane, access to a wide range of imagery has never been easier and with more options.

Still, value creation using imagery on the farm has continued to be elusive, in large part because so much of what row crop farmers and technology integrators hear from imagery vendors is about what they believe farmers want from their imagery. We hear much less from row crop farmers and their agronomists about what is actually working, and what they need more of from imagery as a layer in the farm decision-making process.

Twitter-ScreenshotBack in April, I engaged in a Twitter conversation among some top-shelf farmers and integrators: Steve Pitstick, a northern Illinois farmer; Cory Willness, a Saskatchewan-based agronomist; Jeremy Wolf, an Illinois-based equipment and technology dealer, and Isaac Ferrie, an Illinois crop consultant.

These experts in row crop farming discussed when, how and what type of imagery can help to make actionable decisions in row crops. They asserted that imagery alone does not provide the answer. We need other field data such as weather, soil composition and moisture, field drainage, fertility;

machine as-planted data, as-applied nutrients, and ultimately how to make decisions that trade off reducing cost or increasing yield and revenue.

For all the frustration and confusion about the value of imagery, interest remains remarkably high. An informal poll of our Prassack Twitter followers this past March asked the question, and people are interested — more than 1,000 responded!

Good Examples Abound

So, the table is set: We have a vast array of imagery solutions embedded in ag retailer and co-operative agronomy programs, and strong general farmer interest. But farmers want to know how to take it to the next logical step. “I have this ‘pretty picture’ of my field, but how do I turn it into an actionable piece of collected data that improves the efficiency and/or profitability of my farm?”

As we talk to many farmers and technology integrators in our work, we have been trying to extract some clues about imagery value. We also have researched use cases and return-on-investment studies for industries such as input research, insurance, banks as well as other crop types orchards, vineyards, vegetables, berries, greenhouses, animal management, etc. These are useful as we consider the benefits of imagery in row crops.

When looking at the application of technology to help farmers with decisions, start with the farm operation cycle, which can be defined this way: Planning – Planting – Managing – Spraying – Irrigation – Harvest. With this as a guide, below are seven examples of benefits from imagery use and its partner technologies that combine to deliver actionable value to growers.

1. Plan Variable Rate Prescription Using 5-Meter Satellite Imagery and Near Infrared NDVI processed imagery taken from peak growing periods over 15 years. Topographic imagery and soil composition assist agronomists and their farmers to identify zones for variable rate prescriptions. The images demonstrate plant vigor and stress areas within the field attributable to weather, seed or fertility. Benefit: South Dakota Wheat Growers in Aberdeen, SD, create variable rate prescriptions through 5 meter satellite imagery from Geosys and their proprietary MZB Software solution. Grower customers realize a benefit of 23% better yield at 5% additional input cost.

2. Planting Timing Based on 20-Centimeter Aerial Thermal Imagery. Thermal imagery can help to determine “when is the soil warm enough” to plant temperature sensitive crops like cotton. Benefit: Cotton farmers in Georgia use TerrAvion 9 centimeter thermal imagery to identify fields that are warm enough to plant cotton. The results are that the grower can ensure cotton seeds are planted at the right time, incur less loss from cold or delayed growing system while ensuring faster time to gin.

3. Pivot Irrigation Using 10-Centimeter Aerial Imagery. Nebraska Farmer and Irrigation Technology Specialist Roric Paulmann runs 80 pivots with only 4 inches of available water per year. Imagery indicates the optimal time to apply irrigation for best yield. Benefit: Using AirScout Thermal imagery with the Arable rain sensor on his pivots, Roric sees a cost savings of \$20,000 per pivot.

4. Fungicide Application at Less Than 50-Centimeter Aerial Imagery. Sclerotinia disease risk in canola is based on crop density. Terry Aberhart, a farmer and crop consultant in Saskatchewan, was able to use imagery at this resolution to determine timing and variable rate fungicide application for his canola. Benefit: Improved \$50 per acre net profit.

5. Crop Insurance. Using satellite imagery from RapidEye and aerial imagery from Marvx provides an accurate and timely damage assessment, leading to expedited payment of a claim. Insurance companies also benefit through optimization of their field adjusters' schedules, and better customer satisfaction. Benefit: Faster and more complete payment on claims.

6. Imagery as a Problem Solver. Imagery is also being used to identify problems we did not know we had. For example, during one season, regional precision ag specialist Blain Hope at CHS in Idaho noted a yellow circle in the crop imagery with potato field pivots, indicating a nozzle issue that could be checked out and addressed by a field scout. Benefit: There's a need for "smart nozzles" that can recognize a problem and communicate that they need to be replaced or fixed.

7. Layers of Data for Field Management. From farm management systems like Climate FieldView, we are able to go beyond just imagery. By combining elevation, zone maps, NDVI image, soil and yield maps — we are able to build better field prescriptions. Benefit: by vi-

sualizing the field data we can optimize input selection and costs by production areas of the field.

The bottom line is, imagery is a tool in the toolbox, and as such it is not designed to fix every problem faced on the farm. To maximize its usefulness, imagery must complement the many other resources farmers have at their disposal: soil type data, inputs, weather data, machine data, agronomic knowledge and many others. As an industry, we need to collaborate to leverage our combined learning from all of these data sets. We need to apply this data at different times based on our understanding of the farming process. And ultimately, we need to stop providing raw data and start providing information that helps farmers make the next decision. ■

The Grower Perspective: What I Want From My Ag Retailer

January 31, 201
By: John Reifsteck

Illinois producer John Reifsteck's experience with precision agriculture is deep and wide, but he values trusted partners.

Henry Ford supposedly remarked, "If I had asked people what they wanted, they would have said faster horses." Now, there is no real evidence that he actually made this observation, but the quote does illustrate one of the dilemmas our industry faces these days: We view technology through the lens of the past and not from a vision of what is possible.

Agriculture is accustomed to a world of defined roles — retailers, equipment manufacturers, seed suppliers, and information technology companies working independently, essentially in their own silos, not connected to each other except through the farmer. The farmer has stood in the middle of that mix, attempting to integrate the value that each of these separate entities brings to the farm operation. It was not a role that farmers necessarily were prepared for, or even wanted. It just happened.

That world is changing. Those defined roles are blurring; the silo walls are being eroded by the need to exchange data easily, seamlessly, and cheaply. It means that relationships are changing, and that includes the interactions between farmers and retailers.

So how does a retailer start the conversation about precision agriculture with a farmer? It starts with a self-assessment. The retailer needs to ask himself or herself some questions. How important is it that I offer these technologies to my customers? Where do I fit in the precision equation? And, how committed am I to making the investments necessary to be a successful partner?

These are not rhetorical questions. Farm operations are diverse, and not all farmers will want or will be willing to pay for precision farming technologies delivered by retailers. That retailer self-assessment is the foundation for the conversation with the customer. As a farmer I want to know what my retailer can do and cannot do as well as their plans for the future. This is the place where the farmer-retailer conversation starts. Among the challenges that retailers must manage are the diverse skills, experience, and expectations that farmers have regarding precision farming. I do not anticipate my dealer will be able to answer all of my questions, but I do have expectations they need to meet.

Here is my list of what I want from my retailer:

- Knowledgeable people. Employees who understand technology and what products are available in the market.

- Help make it easy. This stuff is complicated. Anything you can do to make it simpler helps. Wireless data transfer, prepopulating existing databases, and good software and web design are all part of easy.
- To be impressed. Tell me something I do not know about my farm in a way that I understand. Tell me something I can do better.
- Value. I understand what you do costs money. I just need a return on my investment in your services.
- Partnership. Precision agriculture is not just a transaction between a retailer and a farmer. Do not treat it that way.
- Commitment to learning and change. Technology and knowledge change rapidly; you need to partner with me to manage that evolution.
- Collaboration, not just with me, but with all the other parties I need to work with.

Precision farming has been with us for more than 20 years. This technology is a great opportunity for retailers to add real value to the farmers they serve. Let's just not be satisfied with faster horses. ■

Opinion: ROI or Die in Precision Agriculture

May 12, 2017

By: Ben D. Johnson | Email

The thought of \$3.50 corn for the foreseeable future seems pretty disheartening. However, if you look at the precision ag space you might notice some light at the end of the tunnel.

We've progressed to a place where we are collecting volumes of good yield, planting, and as-applied data. However, when it comes to using this data beyond looking at a paper map, we really need to admit we haven't been using it to its full potential. And by "we", I mean both the precision ag specialist and the grower.

Current technology allows us to marry information layers with our financial information. We can then couple it with current grain markets to determine farm financial performance. This has become a must for any operation. In order for us to weather these lower commodity prices, we are going to need to know "the rest of the story," as Paul Harvey put it. Preserving and re-allocating working capital within the operation is of utmost importance.

Here are some important working capital allocation questions to consider:

- How is our VRT fertilizer application paying?
- Is there another crop production scenario that would maximize ROI?
- If I showed these improved projections to my banker, would he be a little more generous on my operating loan and the interest rate?
- In a depressed grain market, what am I going to do differently this year in order to improve my outcome to survive to the next growing season?

Imagine being able to identify areas in a field that have been consistently losing \$250+ per acre per year over the past 3 years or more. Or how about finding other areas of the farm have production capped at 230 bushels because that's all you fertilize for? What if you could utilize the data you've already taken valuable time and money to collect to give you a better idea of where to spend that exact same \$250 to maximize your ROI? How would this change your operation?

The technology to be able to put these layers together to generate profitability zones in a sub-field scale on a map is available and is the sort of tool that will be utilized by the growers who will find their way back to prosperity the quickest. With that in mind, take note of this:

Analyzing profit on a spatial basis trumps EVERYTHING else that we are currently doing in the precision ag space!

As you look at your data in a spatial profitability program, you will notice that yield is not the only major determining factor to profitability and you can potentially improve your profitability without raising more bushels by simply finding areas in your field where you are investing your money inefficiently. Yes, this might require taking a good, long look at the quality of your data; but for many growers utilizing a spatial profitability analysis program could literally mean the difference between staying in business or going broke!

Not every grower has the time or is tech savvy enough to do this effectively. The same can be said about doing taxes, and that's why most of us hire accountants. If you struggle with something like inputting your data

into any of the popular web-based GIS software programs, then it's important to have someone from outside your operation to assist you using the wonders of modern ag-tech. Your trusted precision ag advisor, if equipped with the right tools, may be able to help you with this.

What is Wrong with Using Spreadsheets?

I know a lot of people say spreadsheets are a great tool to measure profitability. However, with the data layers we have collected showing sub-field placement of our variable inputs it's clear that spreadsheets are unable to accurately measure the variable profitability within the field. The new technology is all about managing profitability on a sub-field basis and you will find that spreadsheets just won't cut it as a way of measuring that. I officially thank spreadsheets for their years of service in helping us determine "whole field" or "whole farm" profitability, but now it is time for spatial profitability analysis programs to take over that role.

I know this may be a big change for people, but it's no different than when we moved from typewriters to computers for word processing a few decades ago. A new piece of technology was developed and everyone adapted without looking back. This is exactly what is happening with new GIS software technology and the growers who adopt it first have an advantage over the ones who drag their feet in adopting this technology. I encourage you to talk to your trusted precision ag advisor and ask how to improve your working capital allocation and return on investment by using this new technology. ■

Top 10 Most Intriguing People in Precision Farming

August 1, 2017

By: Matthew J. Grassi | Paul Schrimpf

Here at PrecisionAg® Professional we're all about the numbers.

And taking a look back at the numbers, it appears that many of you thoroughly enjoyed June's featured Listicle, the "Top 10 Most Intriguing Technologies in Agriculture," making it the top viewed item here at PrecisionAg.com over the past 30 days. So, we figured, why not throw another list-type article out there to keep the dialog going strong with our readers as they await fall harvest season?

Seeing how busy everyone in farming seems to be at this critical juncture in the growing season, I won't waste anymore of your precious time with a long-winded, superfluous introduction. Let's just get right down to brass tacks, so without any further adieu, here are our Most Influential Precision Farming Advocates for 2017:

Ed Barnes

Edward (Ed) M. Barnes, Cotton Incorporated

When it comes to precision agriculture in cotton country, very little escapes the notice of Dr. Ed Barnes. As Senior Director of Agricultural and Environmental Research at Cotton Incorporated (CI), he has managed agricultural engineering related projects for the last 14 years. From precision farming, ginning, and irrigation management, to conservation tillage and cotton harvest systems, Barnes is out in front of project coordination and promotion and keeps the momentum going for continuous improvement through technology integration.

He has also served as a team member

in documenting cotton's progress in reducing its environmental footprint while at the same time increasing productivity and currently serves on the Science Advisory Council of Field to Market, The Alliance for Sustainable Agriculture.

An accomplished and recognized ag engineer, Barnes spent seven years in that field with the USDA, Agricultural Research Service (ARS) at the U.S. Water Conservation Laboratory in Phoenix, AZ, developing uses of remotely sensed data for agricultural management, with a focus on water optimization. He's also been a consistent, and active, award-winning member of American Society of Agricultural and Biological Engineers (ASABE) for three decades, serving as chair of the society's Engineering for Sustainability Committee, and is a trustee of the ASA-BE Foundation.

PrecisionAg Professional (PA Pro): What is the most promising product and/or practice that farmers should consider adopting?

Barnes: "While we are making progress, I still want to see greater adoption of yield monitors and the use of those monitors to generate yield maps. Part gets back to the challenge of adopting technology, but it is a lot easier to generate a yield map than it used to be, and this is getting easier all the time. Without a yield map it is impossible to determine if you are hurting or helping yourself with any variable rate management that may be in place. Plus, it is a great way to see how bad the variation in the field is. I know many producers tell me they know where the weak spots are, but is that weak spot yield 500 pounds or 100 pounds per acre? Without

the answers to that question, there is no way to know if you are making or losing money in that part of the field.

Another generic recommendation that will apply to farmers, unless they have a farm that has only perfectly rectangular fields that always have the number of rows that is a multiple of the width of their sprayer, is segmented boom control. It is almost always a safe bet to get a quick payback on investment. Similarly, if producers have a pivot on their farm, adding the ability to control pivot speed to allow slices of the field to automatically get different amounts of water should be given consideration. Just a soil and/or elevation map could be enough information to make some improvements in water use efficiency."

PA Pro: What factors do you feel most hamper technology adoption among cotton producers?

Barnes: "Management time is clearly the biggest factor limiting technology adoption. While we may be able to demonstrate an economic return on investment for a technology, if it is going to take the producer more time to be able to use that technology than the current approach he/she is currently using, that technology has a high probability of failure. We need to find an "easy" button for all our precision technologies — once the value is demonstrated and validated — it all needs to be a black box running in the background. I see this happening in the industry, especially with the opportunities that come with cell modems transmitting data from equipment in real-time. USB sticks have to go the way of the floppy disk (if you are under 30 you will have to Google that last one)." ■