

PRECISION AGRICULTURE DIGITAL DIGEST



# PRECISION AGRICULTURE

A GLOBAL OUTLOOK ON MODERN FARMING FACTS

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Canada

# AGCO PUSHES FARMING EXCELLENCE WITH NEWLY DEVELOPED PRODUCTS

The company now offers six new precision planting equipment upgrades

ANDREW JOSEPH  
FARMS.COM

When introducing new equipment, it is expected that it somehow be an improvement on what is currently being offered in the market.

**AGCO Corporation**, a global leader in the design, manufacture, and distribution of agricultural machinery and precision ag technology, has new precision planting upgrades for six ag categories: planters, seeders, combines, liquid fertilizer applications, dry fertilizer applications, and sprayers. One of the company's portfolios is **Precision Planting**.

*Precision Ag Digital Digest* talked with **Brad Arnold**, the Senior Vice President and General Manager of Precision AGCO.

Arnold said that the company's mission is to "create farmer-focused solutions to sustainably feed our world, and we accomplish that through the manufacture of new equipment."

The company offers new equipment via its brands such as **Fendt**, **Massey Ferguson**, and **Gleaner**, and it capably improves the existing equipment owned by farmers, regardless of brand, through Precision Planting's retrofit technologies.

While every machine developer is keen on outputting some new industry-leading, cutting-edge technology, Arnold noted that it is unlikely that farmers can afford such purchases annually.

He pointed to AGCO's retrofitted technology upgrades offered through Precision Planting, which offer every farmer the opportunity to improve their operation without having to make an expensive capital investment by purchasing new equipment.

"So, a farmer who owns no AGCO equipment and has equipment that is a few years old can still benefit from upgrading their equipment right now without waiting until they're able to buy a new or used piece of machinery already equipped with that technology," related Arnold, though he did add that there are many Precision Planting upgrades that can only be obtained by upgrading the equipment simply because they're not being offered by the factory.

He said that "for some products, those retrofit upgrades provide an improvement in the physical function of the machine. For other products, it is better visibility into what is happening on the machine, and in some cases, both. Precision Planting believes that what gets measured gets improved, and many of our products start with a sensor and then lead to a control system that optimizes the way that specific application is performed."



One of the products from Precision Planting that Arnold said intersects both environmental sustainability and farmer profitability is **ReClaim**, a boom recirculation product.

“Traditionally, farmers need to sit on the edge of the field and spray the product on the ground for 30-plus seconds [to] get the boom primed,” stated Arnold, “to have the proper concentration of chemical across the whole boom.”

He explained that the process of priming a traditional sprayer boom is both wasteful and time-consuming, and it is a process that is often inherently unsafe to humans and the environment around them.

*ReClaim* helps to eliminate those issues by priming the booms before a nozzle even opens.

“It means that your first droplets are effective, and you can get back time, save product, and be a good steward of the environment with your own sprayer,” said Arnold.

The process works because *ReClaim* creates a path from the sprayer boom back to the tank, allowing the product to flow through the boom and back to the tank to be mixed.

It prevents hot spots from forming on the boom and prevents chemicals from settling out in the boom—and it does all this without spraying a drop out of a nozzle.

Arnold said that *ReClaim* can be installed as an upgrade on most of the sprayers owned by farmers today—“just as our other products can be fitted onto existing machinery of any brand as retrofit upgrades,” he mentioned.

The *ReClaim* boom system is a product that is aimed at small grain and row crop producers because of the types of sprayers used—either self-propelled or pull-type.

Due to the different spraying systems used in orchards and vineyards, the *ReClaim* boom recirculation system cannot be used.

**“THE FARMER KEEPS THE BASE MACHINE BUT LEVERAGES PRECISION PLANTING TECHNOLOGY TO PROVIDE A NEW CAPABILITY THAT THE MACHINE DIDN'T HAVE BEFORE.”**

Yes, *ReClaim* allows priming to be done before any product is sprayed from a nozzle, which provides product usage savings, and as noted by Arnold, “*ReClaim* also allows for improved cleanout when an operator switches products, reducing the chance of the first pass of new product burning a susceptible crop.”

It's easy to set up, said Arnold. When a Precision Planting dealer adds *ReClaim*, they only have to remove end caps from the nozzle bar sections, add a fitting, and then attach the hoses to that fitting that flow back to the tank.

Instead of the nozzle bar endcap being a dead end, it makes it a continual path back to the tank.

“This is a true sense of what retrofitting or upgrading a machine means,” noted Arnold. “The farmer keeps the base machine but leverages Precision Planting technology to provide a new capability that the machine didn't have before.”

“The farmer doesn't need a completely new machine to get this new capability, thereby saving them money and improving the function of the sprayer in this instance.”

He added that they also use similar retrofit strategies to upgrade other machine types, such as **SmartFirmer** for planters, **YieldSense** for combines, and **Clarity** for seeders and dry fertilizer applicators.

Currently in development with Precision Planting is its **Symphony Vision** targeted spraying technology that can see a weed, identify the weed, and spray only the areas of the field where weeds are growing—as opposed to old-school techniques of having to spray 100 percent of a field to tackle weeds that may or may not be there. | **paq**



# HOW IS PRECISION AGRICULTURE SAVING THE PLANET?



Precision agriculture has emerged as a transformative approach to farming, utilizing technology to optimize resource usage and enhance sustainability.

The **Association of Equipment Manufacturers (AEM)** conducted a study, *"The Environmental Benefits of Precision Agriculture"*, in collaboration with the **American Soybean Association, CropLife America,** and **National Corn Growers Association,** to quantify the environmental advantages of precision agriculture.

The study examined the impact of various precision agriculture technologies on different types of crops, including row crops, broad acre crops, roots and tubers, and forage.

The findings overwhelmingly demonstrate that precision agriculture can have a positive environmental impact across these areas.

The five key technologies driving precision agriculture include auto guidance, machine section control, variable rate technology, machine and fleet analytics, and precision irrigation.

These technologies optimize operations, minimize overlap, enable precise material application, improve water management, and enhance overall efficiency.

The study revealed significant environmental benefits achieved by farmers adopting precision agriculture technologies.

These include a 4% increase in crop production, 7% increase in fertilizer placement efficiency, 9% reduction in herbicide and pesticide use, 6% reduction in fossil fuel consumption, and 4% reduction in water usage.

The cumulative impact of these improvements is impressive, with 2 million acres of cropland avoided, 30 million fewer pounds of herbicide used, 100 million fewer gallons of fossil fuel consumed, and enough water saved to fill 750,000 Olympic-size swimming pools.

Moreover, the study suggests that full adoption of precision agriculture could unlock even greater benefits.



## Study reveals the positive impact of precision agriculture on the environment and its potential for even greater gains

J.P. MACDONALD  
FARMS.COM

It estimates an additional 6% increase in productivity, 14% improvement in fertilizer efficiency, 15% reduction in herbicide and pesticide use, and a 21% decrease in water consumption.

These advancements could lead to millions of metric tons of CO2 emissions being avoided and further reductions in resource usage.

To accelerate the adoption of precision agriculture, the study emphasizes the need for supportive government policies, increased farm income, improved infrastructure, and effective communication to build trust in the science behind these technologies.

By embracing precision agriculture, farmers can not only contribute to environmental sustainability but also reap economic benefits.

The study underscores the value of precision agriculture technologies and encourages their widespread adoption for a more efficient and sustainable agricultural sector.

Overall, precision agriculture has the potential to revolutionize farming practices, promote environmental stewardship, and ensure a prosperous future for both farmers and the planet. | [pag](#)

**AEM**   
Association of  
Equipment Manufacturers



# A BRIEF LOOK AT THE PELICAN SPRAYER

Drones that spray are a modern-day force in the air

ANDREW JOSEPH  
FARMS.COM

In 2017, **Pyka Inc.** was started by **Michal Norcia**, the company's co-founder and Chief Executive Officer, in his parent's garage.

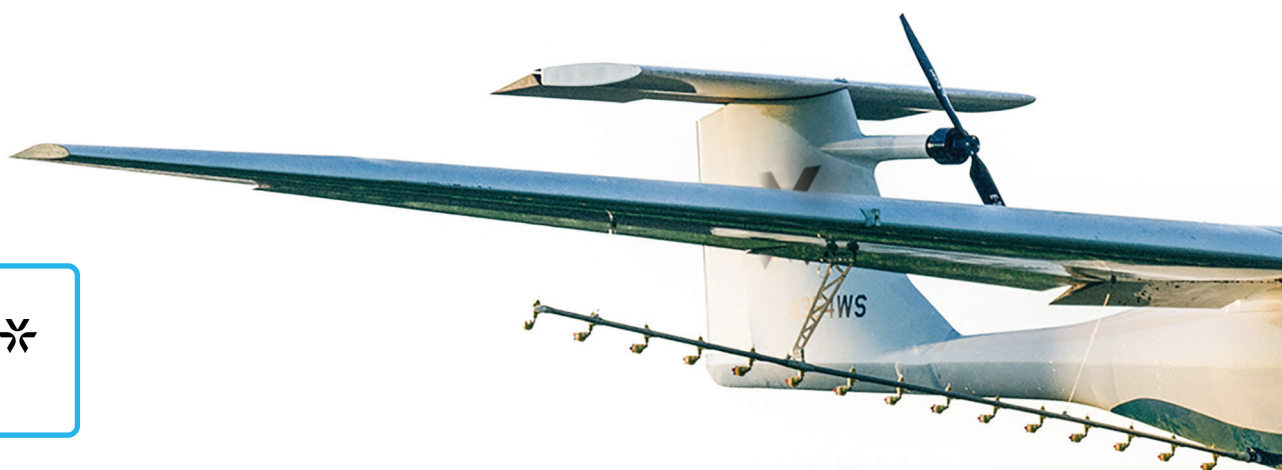
Nowadays, the company is headquartered in Oakland, California, and manufactures large-scale, highly automated electric aircraft for crop protection and cargo transport.

Its **Pelican Spray** drone is fully autonomous and 100 percent electric, offering a highly scalable precision aerial application in a safe, cost-effective, and environmentally friendly way.

Pyka told **Precision Ag Digital Digest** that its drone—with a gross weight of 1,125 lbs—is the largest ever uncrewed aerial system (UAS) to secure an **FAA (US Federal Aviation Administration) 44807** exemption, authorizing it for commercial operation in the United States. It means that it can now operate its zero-emission, highly automated Pelican Spray for commercial crop protection nationwide.

The *Pelican Spray* is an autonomous electric aircraft designed for complex agricultural operations. The aircraft combines best-in-class spray precision and chemical drift reduction technologies to provide safe, clean, and cost-effective crop protection at scale.

PYKA\*



"We are beyond thrilled to celebrate this commercial approval and regulatory milestone," said Norcia. "Pyka's aircraft provide an essential tool for protecting crops, unlocking cost savings for growers, and reducing our impact on the environment."

He continued: "This commercial approval is the first step in enabling us to generate massive value for growers in the US, Latin America, and other markets we operate in, while also laying the operational and regulatory groundwork for eventual scaling into uncrewed cargo operations worldwide."

The drone comes by its name honestly in looks—it's a big, bulky-looking bird, but like its namesake, it is smooth in the air.

Standing seven feet high and with a swath width of 59 feet, it has an empty operating weight of 620 lbs with the batteries and is capable of a maximum take-off and landing weight of 1,320 lbs—the heavier weight could be the chemical spray.

Much bigger than the drones we see flying around by hobbyists, the Pelican Spray looks to be the size of a full-length glider—only this bird has power and wheels and has a wingspan of 47 feet.

Featuring four electric motors providing a combined 100 kW of power, it uses an 18 kWh lithium-ion battery, which Pyka said should be replaced every 2,000 flight hours. It uses four static propellers—two in front and two behind the wing.

It can carry up to 540 lbs. (70 gallons) of liquid and spray up to 240 acres per hour, though the Pyka team flies it for 30 minutes (with a plus-10-minute reserve) before landing to swap out the batteries.

The drone is 100 percent electric, and depending on the available ground charging infrastructure, the minimum recharge time is 60 minutes, though it only takes five minutes to refill the liquid being delivered, swap out the batteries, and complete the requisite taxiing time.

Fast turnaround—yes, but in the sky, it can hit a maximum application speed of 130 km/h.

It is also 100 percent autonomous—it can be operated from anywhere—and it has been purpose-built for industrial agricultural purposes.

And because the drone is capable of faster, tighter turns—it has a turn radius of approximately 590 feet—and can fly very low over a field, there is a reduced chance of drift, which the company said can save some 15 percent of the sprayable chemicals, which saves the farm money.

Although the drone does have the capability to be programmed and operated remotely, Pyka said that it would need to first receive Beyond Visual Line of Sight (BVLOS) approval.

Currently, one operator typically monitors the aircraft through a visual line of sight, while another monitors the autonomous control software. The drone uses a single FPV (first-person view) camera for typical operation.



It is not limited to only day flights—the *Pelican Spray* can deliver chemical spraying at nighttime, attacking nocturnal pests directly and applying chemicals during optimal weather conditions, nearly doubling the viable spray window. Helping it “see” in the dark is LIDAR-based navigation, which includes 3D map making and obstacle detection and avoidance.

In the case of the *Pelican Sprayer*, bigger is better—especially when it comes to safety.

According to the **National Transportation Safety Board (NTSB)**, in 2020 there were 54 reported aircraft accidents involving agricultural operations, 12 of which had a total of 13 fatalities.

The FAA’s action to authorize Pyka’s operations signifies the agency’s commitment to enabling larger and more advanced agricultural UA operations that will save lives and advance American leadership in the \$60 billion global drone market.

Pyka explained that the Pelican comes with a standard fully redundant propulsion system, controls and sensor suite, backup parachute system, and dump door.

“Among other safety and environmental benefits, the use of highly automated UAS like the Pelican to perform potentially hazardous aircraft operations can reduce the number of pilot fatalities that occur each year in the aerial agricultural spraying industry,” said **Lisa Ellman**, partner and Chair of **Hogan Lovells’** Uncrewed Aircraft System Practice and leading policy advocate for the commercial UAS industry.

Using a fixed-wing configuration (like an airplane or glider—as opposed to a rotary-wing helicopter design), the *Pelican Spray* uses highly automated all-electric aerial application technology to give farmers and neighboring communities a safer alternative to piloted spray aircraft.

The aircraft, including the autonomous control software, batteries, inverters, spray system, composite structures, motors, and motor controllers, are all built in-house at Pyka’s corporate headquarters and manufacturing facility in Oakland, although some composite components are now being produced by **Adman Leku**, a globally renowned advanced composites manufacturer.

Not just a big bird, Pyka said that the drone provides increased spray precision, reduces chemical usage costs, and minimizes environmental impact.

Its spray system uses 24 hollow-cone hydraulic spray nozzles and variable-speed rotary atomizers with continuously variable droplet size adjustment as well as a narrow droplet spectrum distribution.

Although the *Pelican Spray* drone sounds like a complex technology, the company said there are a total of four weeks of pilot training required—two weeks of simulator training and two weeks of actual aircraft flight training.

Although new to American airspace, the drone has been used quite effectively on many farms in Costa Rica, Honduras, and Brazil. Its daily chemical tank rinse takes under 20 minutes to perform, while the drone’s disassembly takes under 15 minutes to store in a sea container.

If being transported by a standard-size trailer, its wings can be easily removed, with the fuselage held in place by custom brackets attached to the trailer. | pag



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# BITS & BYTES

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## Robotic Strawberry Picking

Harvest CROO's technology picks ripe strawberries without damage, reducing labor shortages, and promoting precision agriculture for increased crop production. Robotics continue to revolutionize agriculture with affordable, smart, and efficient solutions.

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## Ultra-High Precision Sprayer Makes Splash in NA

Swiss ag tech company Ecorobotix introduces its revolutionary sprayer, ARA, in North America, with two machines sold to top vegetable growers. The ARA's precision, speed, and cost-saving benefits impress farmers, while Ecorobotix plans to expand its presence globally after a successful funding round.

MORE

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## Industry Veterans Partner to Launch Ronin Agronomy

Ronin Agronomy Inc., a visionary precision agronomy company led by Wade Barnes, launches in Western Canada, offering farmers access to innovative technologies and expertise for high-yielding, eco-friendly grain production, meeting global food security challenges.

MORE

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## ADM FarmView: Streamlined Grain Selling with Bushel's Platform

Bushel, a leading agricultural software provider, launches a new app & website for farmers selling grain to ADM, offering real-time data on contracts, settlements, cash bids, and more. A secure, efficient platform enhancing the supply chain.

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## Smart Apply Acquired by John Deere

John Deere adds precision spraying equipment company Smart Apply, known for the Intelligent Spray Control System, enhancing air-blast sprayer performance, and reducing chemical usage while optimizing crop yields and sustainability.

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### Get More From Your FieldView Sub

FieldView™ launches Premium Services in Canada, offering expert support for hardware/software installation, custom script development, and data analysis. Farmers can optimize yield potential, save time, and gain insights.

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### NextGen BIO-CAPSULE TECH™ and Advanced Microbial Delivery

Meristem Crop Performance® unveils the latest BIO-CAPSULE TECHNOLOGY™ for enhanced microbial delivery to crops. This innovation promises bigger yields, nutrient-rich roots, and a revolution in agricultural biological solutions, benefiting farmers worldwide.

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### Will GPS Technology Be Impacted by Solar Maximum?

The increasing reliance on GPS technology in precision agriculture may face challenges from solar maximums and geomagnetic storms, impacting GPS signals and causing disruptions in farming operations.

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### BeeHero's PIP: Revolutionizing Crop Pollination with Real-time Insights

BeeHero unveils Pollination Insight Platform (PIP), utilizing in-hive sensors to measure pollinator activity in crops. PIP empowers growers with real-time data to enhance pollination, elevate yields, and promote sustainable agriculture.

MORE

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### You Can Now Rent Farm Robots

Autonomous mobility company, Burro, partners with Pacific Ag Rentals to provide autonomous agricultural robots for rent across the U.S., aiding farming operations with plug-and-play technology, enhancing productivity, and reducing labor costs. The robots autonomously carry, tow, and more.

MORE



PHOTO: FluxFactory/E+ via Getty Images

# BEE-CAUSE THEY CAN

Company uses bees to apply, on demand, fungicide to plants

ANDREW JOSEPH  
FARMS.COM

Using bees to pollinate one's crops is as old a concept as farming itself. However, using bees to apply fungicide is a whole new area of biotechnology.

Welcome to the world of precision vectoring, headlined by **Bee Vectoring Technology (BVT)**.

Bee vectoring uses bees instead of mechanical spraying of something on a plant. According to BVT, it is safe for the bees to interact with, it is much more precise in application, and there is less wasted product.

Bee vectoring as a concept has been around for a while, but BVT believes it is the first company to take it to a commercial level, thanks to company scientists who found the naturally derived pesticide's active ingredient and realized the potential for bees to deliver it.

To be fair, BVT did say that there are a few other companies around the world that also have ideas on how they could utilize bee vectoring, but the company feels that they are the true pioneers and experts in the field, with not only successful trials but happy customers.

Currently, BVT only has registration to sell its product in the US, but it has applied to and is in the process of applying to other key countries.

*Precision Ag Digital Digest* talked with BVT to learn how precision vectoring changes the landscape of precision agriculture.

**Q How does bee vectoring work?**

**A** The easiest way to think of it is as reverse pollination. Instead of bringing pollen back, the bees bring a bio-fungicide out. As the bees leave their hives, they walk through trace amounts of a specially formulated powder that contains our active ingredient (*Clonostachys rosea CR-7*) as well as a product we call **Vectorite**. The latter allows the bio-fungicide to stick to the bees so they can bring it out into the plants. Once they fly and land on a flower, a few spores rub off the bees onto the plant, where our active ingredient will colonize and prevent other diseases from getting in.

**Q What results are farmers hoping for?**

**A** The main goal is to prevent fungal disease outbreaks in the field, but it also saves money from having to apply other, more expensive chemical fungicides. And, by not having to use those chemicals, it saves them for when you have really bad outbreaks. By not always using a chemical fungicide and applying BVT's biologically derived pesticide, diseases are unable to build up a tolerance to chemical



The BVT technology of precision vectoring is completely harmless to bees as they walk through it to their hive opening, allowing minute amounts of naturally-derived pesticides to be delivered directly to blooms.

overuse. As a bonus, the product has the added benefit of increasing yields anywhere from 15 to 30 percent—a huge bonus to the grower.

**Q What other benefits does bee vectoring offer farmers?**

**A** Other than disease prevention and increased yield, the BVT biologicals methodology uses significantly less water, has no re-entry intervals (farmers or farm workers can work while the bees treat the crop), is organic, and doesn't require any large equipment. From the smallest farm to the largest farm, all can use our product and technology.

**Q Relative to other technologies, what is the cost per acre for bee vectoring?**

**A** BVT's pricing is comparable to a traditional chemical spray. However, with its product, farmers receive a daily-delivered product right to the target area. Chemical or spray applications are limited to maybe once or twice during the pollination period.

**Q Is there a way to measure how successful bee vectoring is for the farmer?**

**A** BVT tries to isolate the fields where the product is being applied, so when it comes to the harvest, the grower can see how much more they have compared to non-BVT-treated fields. The company said it can also set up replicated trials, but those tend to be more complex and take more time and effort.

**Q What types of farms do you serve?**

**A** Primarily, it works on blueberries, raspberries, blackberries, cranberries, almonds, strawberries, and some cherries. However, the bees can work on any pollinated crop that BVT's bio-fungicide will affect, such as canola.

**Q What type of bees are used by BVT?**

**A** The company uses both honeybees and bumble bees (*Bombus impatiens*), which are used because they are both commercially available and are the standard for commercial pollination in most crops.

**Q** How many bees does it take to work a 100-acre canola field?

**A** BVT uses two hives per acre for canola. Assuming it is peak summer, with full hives of around 30,000 bees strong, maybe 15,000 of those bees forage or go to the canola. That implies 200 hives at 15,000 foraging bees per hive, which is around three million bees—but of course, hives vary in bee numbers, activity, and strength. The bottom line is that it takes a lot of bees.

**Q** How long does the biological fungicide last?

**A** The product stays in the hives for the entire pollination period for the bees to carry to the flowers. For blueberries, that's about four to eight weeks; strawberries can take a few months; and canola takes about two to three weeks. It depends on the weather and the type of crop it was applied to.

**Q** How does the farmer know it worked?

**A** That's a great question. We have worked with many universities, CROs (contract research organizations), farmers—you name it—to collect data that supports the BVT product. The data shows that our bee vectoring technology reduces crop disease and increases yields.

**Q** Does the process work better with one type of field over another? IE: Do the bees have discriminating tastes?

**A** Bees definitely have a preferred taste, and some farms have struggled with pollination as other resources became available to the bees. However, bees do tend to feed on the closest and most readily available meal, which is normally the field they are placed on.

**Q** Hasn't there been a global shortage of bees over the past 10+ years?

**A** It is important to distinguish between the commercial bees BVT uses and native bees. Commercially raised and managed bees (honeybees and some bumblebees) are going to be just fine. They are well managed and typically treated for diseases. And, while some years can be hard for honeybees, they typically bounce back over the summer, even if they lose about 50 percent of their hives. It's hard work, and the beekeepers do stress about their hives every year, but commercial bee populations are increasing as the demand for pollination increases. However, it is important to acknowledge that native bees do need our attention and care. | [pag](#)



# HELPING SWINE PRODUCERS MONITOR FEED FLOW

The FeedFlo sensor takes over  
40 readings every second

DIEGO FLAMMINI  
FARMS.COM



A new product is helping pork producers monitor feed flow and alerting them when something goes wrong.

The **FeedFlo** sensor attaches directly onto feedlines inside barns before the first feed drops.

"It can measure how much feed is travelling through the lines," said **Casey Forsyth**, CEO of FeedFlo.

The sensor captures and processes over 40 data points per second 24/7 and uses machine learning to understand the flow feed through barns.

This helps to eliminate out of feed events.

**FeedFlo**

"There's a lot of different systems in a pig barn and it's not uncommon for the feeding system to break down in a way that leaves

animals without feed for an extended period of time," Forsyth said. "By reducing the frequency of these out of feed events, farmers can improve their time to market, feed conversion ratio and make a pretty big bottom line impact."

If the FeedFlo system senses something wrong within the feed system, it will alert farmers through a mobile app that also senses changes in consumption.

**"IT CAN MEASURE HOW MUCH FEED IS TRAVELLING THROUGH THE LINES."**

"A sudden drop in consumption in a group of animals could be at the beginning of a disease challenge," Forsyth said. "And our data allows people to go back and look at the disease challenge after the fact and see what the impact was to their feed consumption over time."

FeedFlo can also support automated feed ordering and monitor bin inventory.

Many members of the ag community have expressed support for FeedFlo too.

Animal nutritionists and veterinarians are excited about the animal health aspect of what the sensors bring, Forsyth said.

FeedFlo could also be used in poultry and even aquaculture operations.

But right now, the focus is on the swine industry.

"We want to make sure we're solving tangible problems for one group of people before we move on to tackle issues in other sectors," Forsyth said. | pag

# PRECISION AGRICULTURE

A global outlook on modern farming facts

RYAN RIDLEY  
MANAGING EDITOR

It's harder than ever to sift through accurate information these days.

That's why we've created this column to stick to the facts of modern farming.

Let's explore adoption levels and barriers to adoption, current and future market forecasts, and most popular uses-cases.

## Adoption Levels

According to a global survey of 5,500 row and specialty crops farmers across the world, North American farmers (United States and Canada) are some of the most forward-thinking in the world.

The survey was conducted by global management consulting firm McKinsey and Company.

61% of North American farmers are currently using or planning to use at least one ag technology in the next two years. This ranking is only second to Europe, with 62% adoption. Globally, it is sitting around 39%.

Here's a global breakdown of the surveyed regions:

- Europe: 62%
- North America: 61%
- South America: 50%
- Asia: 9%

## Barriers to Adoption

Barriers to entry in North America are cited as high costs at 52% and unclear return on investment (ROI) at 40%.

Examining globally, 47% of respondents claimed the high cost was in the top-three barriers to adoption and 30% had unclear ROI as a top-three reason. 50% of surveyed farmers were not willing to pay anything for ag technology.

Perhaps because the minimum expectation on ROI for surveyed farmers is 3:1. This is indeed high, but the problem lies in proving ROI for ag tech.



## Precision Agriculture Market

According to a ResearchAndMarket.com report, the global precision ag market was valued at USD \$7.89 billion in 2022 and is expected to climb to USD \$14.61 billion in 2027.

That's a compound annual growth rate of 13.12%.

The same company reported the North America precision agriculture market sized reached USD \$3.8 billion in 2022 and is expected to reach USD \$7.5 billion by 2028.

International Market Analysis Research and Consulting Group (IMARC Group) aligns with the ResearchAndMarket.com report on North America market size predictions, and further elaborates on market share by technology.

- GNSS/GPS Systems: 28%
- GIS: 22%
- Remote Sensing: 20%
- Variable Rate Technology: 18%
- Others: 12%

## Most Popular Use-Cases

McKinsey and Company's survey indicated farm-management software takes the lead with North American farmers at 47% currently or planning to use in the next 2 years. Management software is also used most globally at 25%.

28% of North American farmers are or will be using hardware, 28% remote sensing, and 13% related to sustainability technology.

Here's the global breakdown of current usage or planned usage within the next two years:

Think about an increase in yield, how many variables are coming together that could contribute to the increase (weather is a big one).

Then there's the data issue. Who has access to all this data generated on farm? 20% of farmers globally cited this as a top barrier in adopting farm management software according to McKinsey and Company's survey.

	MANAGEMENT SOFTWARE	PRECISION AGRICULTURE HARDWARE	REMOTE SENSING	SUSTAINABILITY RELATED TECH
NORTH AMERICA	47%	28%	28%	13%
EUROPE	35%	26%	37%	18%
SOUTH AMERICA	31%	28%	31%	16%
ASIA	3%	4%	4%	4%
GLOBAL	25%	18%	20%	10%

## Sustainability

Brazil is leading the way in sustainability while Europe is top for carbon programs.

When it comes to variable rate fertilization, Brazil's adoption is 51% followed closely by the United States at 50%. Canada is behind the global adoption (34%), sitting at 31%.

Brazil also leads the way in low-till farming (83%), followed by Canada (69%), Europe (67%), and the United States (60%).

Europe is the most focused when it comes to cover crops (82%), with Brazil (59%), Asia (53%), and the United States (50%) trailing. Canada only ranks at 27%.

In the controlled release and stabilized fertilizer space, Brazil again leads with 52% followed closely by the United States (48%) with Canada and Europe each at 42%.

## Hardware

Overall adoption of hardware lags software usage with global adoption at 18%. North America leads the charge at 28% followed by South America (27%) and Europe (21%). Asia is hardly on the radar at 4%.

A further breakdown shows the current or planned usage of hardware.

Well, that's a lot of data to digest.

Here's another stat for you: the United Nations estimates the population will reach 8.5 billion in 2030.

Its evident that precision agriculture practices and technologies will be essential in keeping the world fed.

Farmers across the globe continue to push the envelope when it comes to innovation and sustainability, but how do we increase ag tech and precision ag adoption for all types and sizes of farms?

Do we need to focus more on demonstrating return on investment? With high interest rates farmers will be even less willing to invest in new technology if there is not a clear ROI.

In the **June 2023 issue of the Precision Agriculture Digital Digest**, Andrew Joseph explores adoption barriers and examines what manufacturers can do about it. | [pag](#)

	YIELD MONITORING & MAPPING	VARIABLE RATE FERTILIZER APPLICATION	SPRAYER SECTION CONTROLLERS	IN-FIELD SOIL SENSORS
NORTH AMERICA	76%	76%	70%	37%
EUROPE	40%	40%	53%	47%
SOUTH AMERICA	79%	79%	77%	56%
ASIA	42%	42%	44%	47%
GLOBAL	69%	67%	67%	45%

# ACCURATE SOIL MOISTURE READINGS AT YOUR FINGERTIPS

SpotOn from Innoquest operates at a higher frequency than other products

DIEGO FLAMMINI  
FARMS.COM

A new product from Innoquest can provide farmers with accurate soil moisture data in seconds.

The company's **SpotOn Soil Moisture Meter** collects multiple pieces of information, says **Bill Hughest**, president of Innoquest.

"It can quickly give you moisture readings for soil volumetric water content as well as salinity and soil surface temperature information in Celsius or Fahrenheit," he said. "It's a straightforward unit and it's easy to use because that's what our customers want."

Farmers can then use the collected data to determine if they need to apply fertilizer or irrigate to flush out salts, he added.

One of SpotOn's features setting it apart from other products is the frequency it operates at.

The unit uses three AA batteries and runs at 100MHz. Some other available soil sensor products operate at 70MHz.

The higher frequency allows the moisture meter to provide accurate readings in multiple types of soils.

"The level of salts or organic or clay matter in soils can skew readings for volumetric water content," he said. "By operating at a higher frequency, we're able to minimize the possibility of that."

**"IT CAN QUICKLY GIVE YOU MOISTURE READINGS FOR SOIL VOLUMETRIC WATER CONTENT AS WELL AS SALINITY AND SOIL SURFACE TEMPERATURE INFORMATION IN CELSIUS OR FAHRENHEIT."**

Farmers who purchase the *SpotOn Soil Moisture Meter* will receive the unit and two sets of rods – 2.4" and 1.5", and the rods can be stored in the meter's handle when not in use.

The *SpotOn Soil Moisture Meter* retails for US\$995 and can be purchased from multiple distributors. A list of distributors is available on Innoquest's website. | [pag](#)

## THE PRODUCT IS ALSO AVAILABLE FROM SELECT COMPANIES IN CANADA:

- Rittenhouse
- Farmtronics
- Green Lea Ag
- Delaware Pump
- Harjo

**innoquest**  
Inc.

# NANOTECHNOLOGY AND ITS PLACE IN SUSTAINABLE AGRICULTURE



A look at nanotechnology and why it's the new buzzword in agricultural sustainability

ANDREW JOSEPH  
FARMS.COM

A recent press release declared that *"The World Nano Foundation Unveils Groundbreaking Whitepaper on Nanotechnology's Impact on Sustainable Agriculture."*

Sounds important. Before we get to the ag part you know and love, raise your hand if you know what nanotechnology is. For those who are aware of nanites, the microscopic robots, we can assume that nanotechnology is also small.

## What's the big deal about small?

If we shorten it to nano agriculture, it is using nanotechnology's concepts and principles in ag science to design, produce, and use structures, devices, and systems by manipulating atoms and molecules at the nanoscale.

Nanoscale? It means having one or more dimensions of the order of 100 nanometers, which is 100 millionths of a millimeter or less. Keep in mind that a sheet of paper is about 100,000 nanometers thick = 0.0039370079 of an inch. The point is that it's small.

While it is the new ag buzzword, we should point out that it's been a "thing" for over a decade or more. We are, however, now better at being small.

The concept of nanotechnology in agriculture could result in better manipulation of processes to create more with less input, that's why the World Nano Foundation's recent release of its new whitepaper titled *Commercial Applications for Nanotechnology and Agriculture* is so exciting.

The **World Nano Foundation**, a leading not-for-profit membership organization dedicated to the international commercialization of nanoscale technologies across 16 industry sectors

The Foundation works with companies and people to gain support and funding to bring the science of the ultra-small to the world and commerce—and as such, it is no wonder it wants to promote the largeness of smallness.

The foundation helps entrepreneurs, inventors, professors, and professionals from a business-up perspective develop and hopefully commercialize new nanotechnologies that can improve the world—and the world of agriculture is a key sector.



The document noted that as the world's population continues its growth, countries everywhere need to produce larger crop yields on the same amount of space—assuming that the amount of fertile farmland remains unchanged—while also ensuring environmental sustainability.

In North America, the concept of urban sprawl has seen viable farmland swallowed up by the next generation of suburbia. Government shortsightedness hampers the national promise to provide more food to feed those unable to do so themselves.

However, the concept of nanotechnology in agriculture could result in better manipulation of processes to create more with less input.

The foundation's report said that nanotechnology—the manipulation of matter at the microscopic nanoscale level—is a powerful tool to better address global food security issues.

The whitepaper examines multiple ways that nanotechnology is currently impacting sustainable agriculture, such as through precision agriculture, smart delivery systems for agrochemicals, disease detection, and food preservation.

It noted that by using nanosensors and nanomaterials, farmers can optimize their crop yields, reduce product waste, and minimize environmental impact while promoting safer and more efficient agricultural practices.

**Dr. Peng Zhang**, a Senior Research Fellow at the **University of Birmingham** (UK), explained that “Integrating AI and nanotechnology into precision agriculture will play a vital role in probing the design parameters of nanomaterials for use in fertilizer and pesticide delivery to ensure minimal impacts on soil health coupled with minimal nanomaterial residues remaining in the edible tissue portions—helping to ensure safe and sustainable agriculture.” The whitepaper prepared by the World Nano Foundation offers insight into the pioneering work of such renowned research institutions as **Aberystwyth University** (Wales, UK), the **University of California, Davis** (USA), the **National Institute of Agricultural Technology** (Hurlingham, Argentina), and the **Indian Institute of Technology, Delhi** (India).

These four institutes are considered to be at the forefront of developing and applying nanotechnology to enhance crop protection, nutrient uptake, and precision agriculture.

In addition to discussing academic research, the whitepaper also showcases several spin-out nanotech companies, including:

- **Vestaron Corporation** is located in the **Western Michigan University** College of Engineering and Applied Sciences in Kalamazoo, Michigan. It is helping lead a peptide-based revolution in crop protection via safe insecticide development;
- **Apeel Sciences**, located in Goleta, California, has developed an edible coating product that can make some citrus and other fruits last twice before spoiling by using a tasteless edible coating made from plant materials;
- Although the data provided to **Precision Ag Digital Digest** indicated that one of the companies was called *Nanocare Technologies*, which is a private biopharmaceutical company located who-knows-where, the similar-sounding **Nano-Care** sounds more promising. It is a spin-off entity from the **Leibniz Institute for New Materials (INM)** in Saarbrücken, Germany, and it has created invisible high-performance coatings using its expertise in nanotechnology, bionics, and process engineering. Yes, this sounds more correct;
- **NanoPhos SA**, located in Athens, Greece, is a smart coatings developer and manufacturer.

These four companies were described in the whitepaper as having leveraged nanotechnology to create environmentally friendly biopesticides, plant-based coatings for food preservation, and nanomaterial-based fertilizers to improve crop productivity sustainably.

Also discussed within the *Commercial Applications for Nanotechnology and Agriculture* whitepaper is the rapid growth expected in the market for sustainable agriculture.

Analysts are projecting a compound growth rate of 25.4 percent, which they expect will lead to a worldwide nanotechnology market of some \$16.7 billion by 2025. Increasing demand for sustainable agriculture practices and innovative nanotechnology-based solutions are the major drivers behind this optimistic market outlook.

**“NANOTECHNOLOGY OFFERS EXCITING POSSIBILITIES FOR SUSTAINABLE AGRICULTURE, PARTICULARLY IN PRECISION AGRICULTURE AND TARGETED DELIVERY OF NUTRIENTS AND PESTICIDES.”**

Although there is great optimism for utilizing nanotechnology for sustainable agriculture, the whitepaper also acknowledges that it won't be a simple process, with several barriers that will need to be overcome for more widespread adoption.

Scaling up nanotechnology applications while maintaining effectiveness and ensuring proper distribution is a crucial challenge.

Of course, equally important as increasing effectiveness is ensuring that the process remains safe for the environment, human health, and other living organisms. The whitepaper suggested that the establishment of robust regulatory frameworks and transparent communication with consumers will be key to creating and ensuring public trust and acceptance of the process. People tend to fear what they don't fully understand.

Professor **Peter Majewski**, Director of the **University of South Australia's Future Industries Institute**, explained that “Nanotechnology offers exciting possibilities for sustainable agriculture, particularly in precision agriculture and targeted delivery of nutrients and pesticides.”

He continued: “With careful consideration of the risks and potential ethical concerns, nanotechnology can play a vital role in meeting the world's food security and environmental sustainability challenges.”

Experts in the field and peer-reviewed publications such as **NPJ Sustainable Agriculture** and **NANOGRAFI** have shown support for nanotechnology's potential in advancing sustainable agriculture.

There is an acknowledgement of the transformative role nanotechnology can play in achieving ecologically friendly and equitable food production systems while addressing the challenges of food security and environmental sustainability. | pag



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01



### Using Artificial Intelligence to Manage Your Herd Health

OneCup AI talks about its facial and full body recognition software. New this year, the ag tech can determine calving events. The next model will also include estrus detection capabilities. Learn how this technology can improve your operation.

WATCH | ▶

04



### Precision Feeding with the NEW Gestal Select System

Jyga Technologies shares details about its new Gestal Select System, a precision pig feeding system. The system uniquely feeds individual pigs with custom blending options to optimize diets and avoid over-formulation.

WATCH | ▶

02



### Bridging the Gap

5th-gen potato farmer, Tyler Heppell, talks about how he is bridging the gap between traditional farming to new age agriculture. Heppell discusses innovation, technology, labor, management, education, social media, succession planning and more.

WATCH | ▶



03



### Water Driven Yield Potential Model

Crop Intelligence explains how its App interprets weather station data by using accumulative rainfall, expected precipitation and crop available moisture to model yield potential. Watch to learn how this system will help you make real-time decisions on your farm.

WATCH | ▶

05



### Considerations for Drone Spraying and Seeding

Crop and precision ag experts discuss the considerations for spraying and seeding with large agriculture drones. Where will it work, where won't it. The experts discuss challenges and successes.

WATCH | ▶



06

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### Creating and Editing Flags in Operations Center

Wondering how to create and edit flags between John Deere Operations Center and the Generation 4 Display? This video walks you through the process of establishing categories, placing flags, exporting, editing and more.

WATCH | ▶



08

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### Smart Farming with AGCO's Fuse

Fuse Smart Farming is an open platform for digital farming worldwide. Empowering AGCO brands and farmers with tailored solutions, it boosts yields and profitability, reduces risk, optimizes resources, and digitalizes data.

WATCH | ▶

09

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### Precision Ag Can Aid Crop Insurance Reporting

A Precision Ag Specialist delves into how precision ag tools and data contribute to improved crop insurance reporting.

WATCH | ▶

# WHAT'S NEW IN THE WORLD OF PRECISION AGRICULTURE?

WATCH & LEARN TO FIND OUT

07

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### Hillco Technologies' Combine Leveling System

Case IH combines and the Hillco leveling system have empowered farmers to optimize production for 30 years. Amid evolving farming technology, Hillco and Case IH collaborate to ensure user-friendly and maintainable leveling systems in every new combine.

WATCH | ▶

10

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### Horsch Introduces Autonomous Planter for Precision Farming

After two decades of development, Horsch unveiled its autonomous planter, the Gantry RO G 500, at a farm show in Brazil. The self-propelled seeder optimizes planting with computer-guided precision.

WATCH | ▶

# PROVIDING FARMERS “CLARITY” WHEN IT COMES TO FLOW MONITORING

Precision Planting’s latest product helps producers gain more visibility into seeding and fertilizer applications

DIEGO FLAMMINI  
FARMS.COM

A new product from Precision Planting allows farmers to see monitor product flow and potential blockages in real time.

Using **DICKEY-john** sensors that many farmers are already using, and a **Gen 3 20|20** monitor, **Clarity** allows growers to visualize product flow and distribution.

“Clarity gives growers row-by-row details of their granular product,” said **Shawn Livingston**, Precision Planting’s eastern Canada regional manager. “And that’s whether it’s on a strip-till, air seeder, box drill or corn planter using granular fertilizer.”

An important point Livingston wants farmers to understand is the difference between metering a product and delivering a product.

Metering refers to a shaft going around, and product flowing through that meter. Delivery to the rows happens after that.

“They’re two different monitoring systems,” he said. “If a shaft is going around has a speed sensor on it, that’s saying the system is applying product no matter what. What Clarity is doing is confirming that because the shaft is going around, there’s still product flowing through that shaft.”

Showing row-by-row flow is a change from other available products.



Other similar products only showed whether the equipment had flow or not, but wasn’t able to determine if flow levels changed.

**“HAVING DATA NUMBERS TO LOOK AT HELPS FARMERS SEE PROBLEMS AS THEY HAPPEN AND ALLOWS THEM TO ACT QUICKLY TO FIX THOSE ISSUES.”**

*Clarity* can provide more specific data.

“Because of the way it reads the signals and interprets the data coming back, Clarity gets high level information,” Livingston said. “Having data numbers to look at helps farmers see problems as they happen and allows them to act quickly to fix those issues.”

In addition to providing row mapping, *Clarity* can identify changes in:

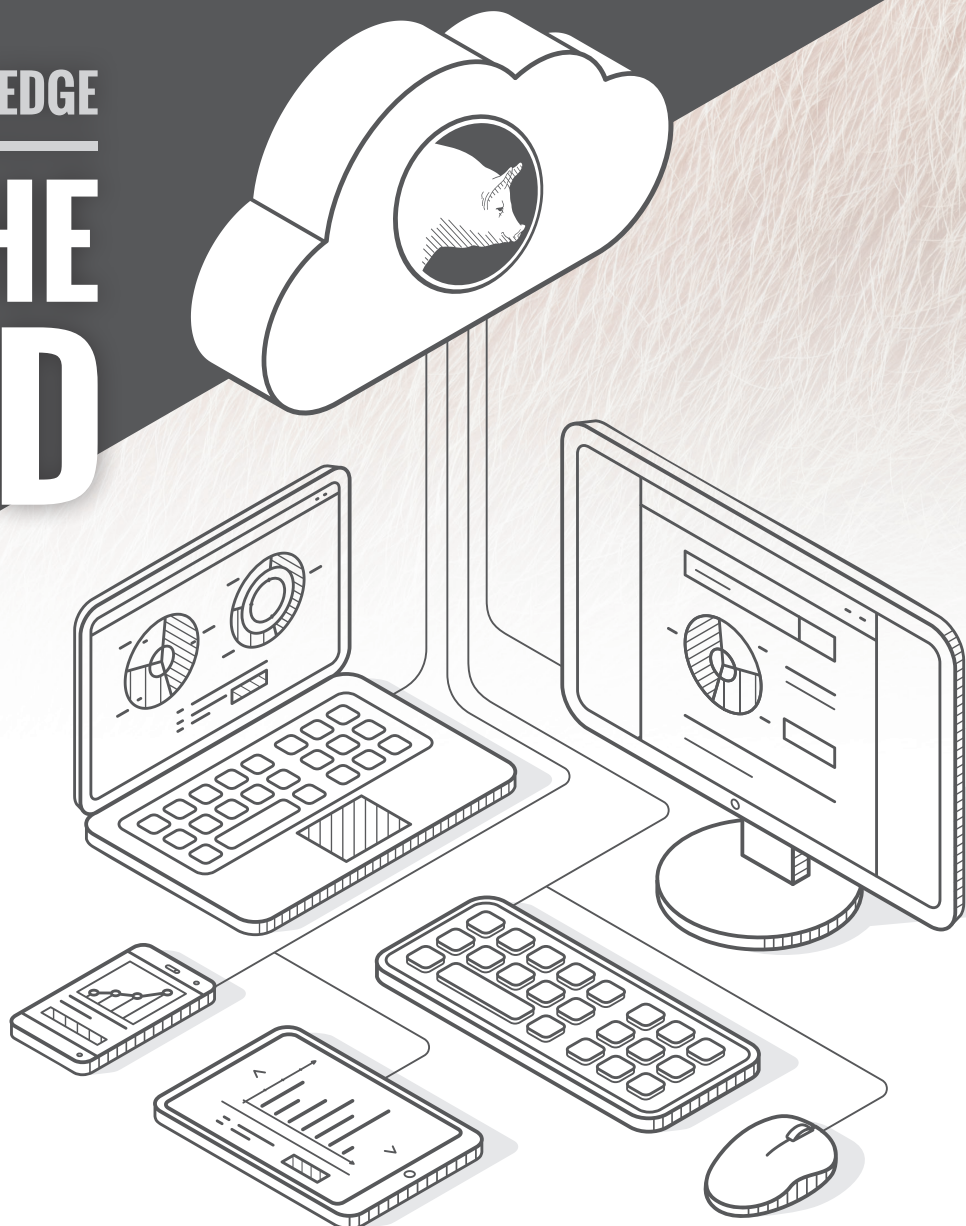
- **Product Magnitude** – the amount of product flowing through the sensors,
- **Product Uniformity** – which shows how even the system is delivering the product to each row, and
- **Product Deviation** – which displays how each row compares to the average amount of product being applied.

Having this detailed information available to a producer can help him or her ensure crops receive the best chance to succeed.

“If you think about wheat seed, most of it that goes down in the fall is being blended through the meters with seed and fertilizer,” Livingston said. “What happens if the fertilizer plugs and we’re getting seed but no fertilizer? As a grower, if I plant five acres with a system that’s telling me I have flow but only one of my products is flowing, I have a yield loss right away.” | **pa**

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