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ACCELERATING AI INNOVATION IN AGRICULTURE

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NEW FRAME-MOUNTED ROW CLEANER TECHNOLOGY HELPS MAXIMIZE YIELDS

Precision Planting's Reveal™ improves row unit ride and downforce consistency

RYAN RIDLEY
FARMS.COM

It's a well-known fact that crop emergence consistency is essential for maximizing yields, but how can farmers ensure that seeds make it through residue and into an ideal seeding environment?

Leading provider of precision agriculture technologies, Precision Planting, has developed a new frame-mounted row cleaner called Reveal™ that improves row cleaning and emergence.

This new technology earned the name Reveal™ as the frame-mounted row cleaner reveals clean soil for seed placement.

"Row-unit-mounted row cleaners can hurt row unit ride and affect down force requirements," explains Bryce Baker, Precision Planting marketing manager. "Reveal™ is frame mounted, removing its impact on the row unit."

Precision Planting®

The company boasts three ways that Reveal™ can improve row cleaning and emergence.

The frame-mounted row cleaner eliminates the negative effects that unit-mounted row cleaners have on row unit ride and downforce, as described by Baker.

"The big difference with Reveal is that it's mounted on the actual planter bar, so it's completely separate from the row unit," says Carl Dodge, a farmer in Iowa who experimented with Precision Planting's Reveal™ this growing season.

Reveal™ also has tine depth adjustment on the unit with independently adjustable pressure from the cab. Baker points out that traditional row cleaners have limited tine engagement, so if the residue is too thick, they often cannot clear the full depth.

"Reveal has independent pressure adjustment and cleaning tine depth adjustment, so you can set the pressure you need to keep the internal gauge wheel on the ground," says Baker. "This helps eliminate bounce of the row cleaner and allows you to then

PHOTOS: precisionplanting.com, hudiemm/iStock/Getty Images Plus

use a T-handle to set exactly how deep the cleaning tines should operate in a particular field, and ensure excellent row cleaning."

Another crucial component of Reveal™ is its internal gauge wheel that gauges tine depth from the cleaned surface, removing residue as the depth varies.

"With its own internal gauge wheel, Reveal™ precisely controls the depth of the cleaning tines to create a consistently clean and ideal seeding environment for even emergence to occur," adds Baker.

Dodge was surprised with the results from his Reveal™ trail this season.

"Every metric that we are tracking that makes a difference - singulation, spacing, good ride quality - the number one row unit, every single time, was one of the two rows that we had the Reveal™ row cleaners on."

"EVERY METRIC THAT WE ARE TRACKING THAT MAKES A DIFFERENCE - SINGULATION, SPACING, GOOD RIDE QUALITY - THE NUMBER ONE ROW UNIT, EVERY SINGLE TIME, WAS ONE OF THE TWO ROWS THAT WE HAD THE REVEAL™ ROW CLEANERS ON."

The product was first revealed at the 2021 Precision Planting Winter Conference and is now available through the company's Premier Dealer network.

Click the video link below to watch Precision Planting product manager, Jason Stoller, provide an overview of Reveal.

WATCH THE VIDEO

THE BEE'S KNEES OF PRECISION AGRICULTURE

Ubees lands $8M to accelerate precision beekeeping and pollination services

RYAN RIDLEY
FARMS.COM

Investments continue to drive technological advancements across all aspects of agriculture and the bees are starting to hop on the bandwagon.

Ubees, a provider of precision beekeeping and pollination services, recently landed $8 million in growth capital, led by WindSail Capital Group.

It's no secret that bees are essential in pollinating fruits, vegetables, and nuts – it's said that 1 out of every 3 bites of food we eat are pollinated by bees – what may surprise you though is the advancements in beekeeping from a precision ag perspective.

"We are incredibly excited to be working with the Ubees team. More than one-third of the world's food crops are dependent on pollination while bee populations have declined over the years," explains Matthew O'Rourke, Principal at WindSail Capital Group. "Meanwhile, demand for pollination dependent crops such as almonds have increased to historic levels. Ubees is well positioned to deploy its pollination expertise and innovative technology to improve efficiencies for the world's food supply chains."

The company uses sensors that provide non-intrusive precision monitoring of colony strength, population evolution, and hive activity – everything a beekeeper needs to remotely monitor hive health and make data driven decisions.

Like many precision ag practices, monitoring is key for success and precision beekeeping is no different. Ubee's technology monitors and quantifies parasites, pathogens, pesticides exposure, as well as nutritional assessments of a bees diet.

PHOTO: Ale-ks/iStock/Getty Images Plus

The end goal is to 'reduce bee mortality rates and help to sustain pollination at the industrial scale' says Ubees' website.

"We found the perfect alignment between WindSail and Ubees in our mission to expand pollination services in the U.S. and abroad, which are essential to our food production," said Arnaud Lacourt, Ubees' Co-founder and Chief Executive Officer. "We immediately understood each other, and I knew right away that WindSail was the right partner to collaborate with in the most sustainable way."

Ubees has big plans for this funding round:

- **Accelerate the deployment of its digital marketplace**
- **Grow its pollination services business**
- **Deploy its IoT sensor technology to monitor bee health and efficiency**
- **Develop algorithms to sharpen pollination monitoring and agricultural data**
- **Expand to new crops and geographies**

The company currently operates 10,000 hives across the United States managing more than 50 customers. They also have a research and development center in Europe and recently started a new project in South America.

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ACCELERATING AI INNOVATION IN AGRICULTURE

11 new research institutes backed by $220M investment from USDA-NIFA and NSF

RYAN RIDLEY
FARMS.COM

Agriculturalists who are looking to utilize artificial intelligence (AI) on their operations, whether it's on the farm or within an agribusiness, are in luck – and in a big way.

The U.S. Department of Agriculture's National Institute of Food and Agriculture (USDA-NIFA) and the U.S. National Science Foundation (NSF) recently announced a $220 million investment into 11 new AI research institutes.

"In the tradition of USDA-NIFA investments, these new institutes leverage the scientific power of U.S. land-grant universities informed by close partnership with farmers, producers, educators, and innovators to provide sustainable crop production solutions and address these pressing societal challenges," says Dr. Carrie Castille, USDA-NIFA Director. "These innovation centers will speed our ability to meet critical needs in the future agricultural workforce, providing equitable and fair market access, increasing nutrition security and providing tools for climate-smart agriculture."

The USDA-NIFA and NSF aligned with Google, Amazon, Intel, Accenture, and the U.S. Department of Homeland Security to achieve its investment goals.

This funding will bring many AI advancements into the agriculture sector including:

- **AI: Human-AI Interaction and Collaboration**
- **AI for Advances in Optimization**
- **AI and Advanced Cyberinfrastructure**
- **AI in Computer and Network Systems**
- **AI in Dynamic Systems**
- **AI-Augmented Learning**
- **AI-Drive Innovation in Agriculture and the Food System**

The latest $220 million investment follows the first round of investments that took place in 2020, totaling $140 million into seven AI Research Institutes.

"I am delighted to announce the establishment of new NSF National AI Research Institutes as we look to expand into all 50 states," said National Science Foundation Director Sethuraman Panchanathan. "These institutes are hubs for academia, industry and government to accelerate discovery and innovation in AI. Inspiring talent and ideas everywhere in this important area will lead to new capabilities that improve our lives from medicine to entertainment to transportation and cybersecurity and position us in the vanguard of competitiveness and prosperity."

THE 11 NEW AI RESEARCH INSTITUTES INCLUDES:

01

The USDA-NIFA Institute for Agricultural AI for Transforming Workforce and Decision Support (AgAID)

This institute will integrate AI methods into agriculture operations for prediction, decision support, and robotics-enabled agriculture to address complex ag challenges related to labor, weather, water, and climate change, led by Washington State University.

02

The USDA-NIFA AI Institute for Resilient Agriculture (AIIRA)

This institute will work to transform agriculture through AI-driven digital twins that model plants at an unprecedented scale enabled by advancements in computational theory, AI algorithms, and tools for crop improvement and production resiliency to climate change – led by Iowa State University.

PHOTOS: DS70/E+ via Getty Images, PhonlamaiPhoto/iStock/Getty Images Plus

03 NSF AI Institute for Collaborative Assistance and Responsive Interaction for Networked Groups (AI-CARING)

Not specific to agriculture, this institute is tasked with creating a fully developed discipline focused on personalized, longitudinal collaborative AI systems that learn individual models of human behavior and how they change over time, led by Georgia Institute of Technology.

04 NSF AI Institute for Advances in Optimization

This institute is looking to revolutionize large-scale decision-making by fusing AI and mathematical optimization into intelligent systems, led by Georgia Institute of Technology. It will make foundational advances on use cases in energy, sustainability, supply chains, and circuit design and control.

05 NSF AI Institute for Learning-Enabled Optimization at Scale (TILOS)

This institute aims to "make impossible optimizations possible" by addressing scale and complexity challenges. Learning-enabled optimization will be applied in several technical areas including semiconductor chip design, robotics, and networks. This institute is led by the University of California San Diego in collaboration with five universities across the United States.

06 NSF AI Institute for Intelligent Cyberinfrastructure with Computational Learning in the Environment (ICICLE)

This institute is tasked with building the next generation of cyberinfrastructure making it easier for scientists to use and promote its further democratization. ICICLE will transform the AI landscape by creating a robust, trustworthy, and transparent 'plug-and-play' national cyberinfrastructure to be used in precision agriculture and animal ecology. This institute is led by Ohio State University.

07 NSF AI Institute for Future Edge Networks and Distributed Intelligence (AI-EDGE)

This institute, led by Ohio State University, will leverage synergies between networking and AI to design future generations of wireless edge networks that are highly efficient, reliable, robust, and secure.

08 NSF AI Institute for Edge Computing Leveraging Next-generation Networks (Athena)

While keeping complexity and costs under control, this institute led by Duke University will develop edge computing with AI functionality. With collaboration between leading scientists, statisticians, and engineers, this institute will transform the design, operation, and service of future systems from mobile devices to networks.

09 NSF AI Institute for Dynamic Systems

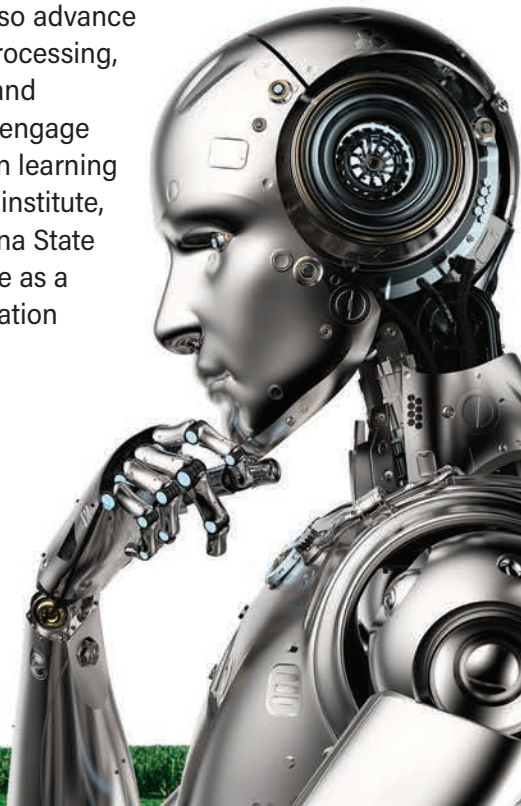
This institute will enable innovative research and education in fundamental AI and machine learning theory, algorithms, and applications specifically for real-time learning and control of complex dynamic systems. This institute is led by the University of Washington.

10 NSF AI Institute for Engaged Learning

This institute, which is led by North Carolina State University, will advance natural language processing, machine learning, and computer vision to build narrative-centered learning environments, embodied conversational agents, and multimodal learning analytics to yield transformative advances in STEM teaching and learning.

11 NSF AI Institute for Adult Learning and Online Education (ALOE)

This institute will also advance natural language processing, machine learning, and computer vision to engage learners in AI-driven learning environments. This institute, led by North Carolina State University, will serve as a hub for STEM education innovation.



PRECISION AG ENVIRONMENTAL BENEFITS FANTASTIC, AS ARE THE ECONOMIC BENEFITS!

ANDREW JOSEPH
FARMS.COM

Precision agriculture technology study shows positive results in environmental benefits and farm economics

It's official, the era of precision agriculture has arrived, and its technologies are helping crop farmers make significant gains, according to a study produced by the Association of Equipment Manufacturers (AEM).

The United States Department of Agriculture (USDA) has identified the three pillars of sustainability for the agriculture industry: 1) reduced environmental impact; 2) increased productivity and yield, and; 3) a better overall economic result. Although simple enough in its statement, it doesn't work effectively unless all three elements are met.

"For the environmental benefits of precision agriculture to take shape, farmers need to generate more yield and at least break even from a financial standpoint," said Curt Blades, AEM Senior Vice President of Ag Services. "If a farmer is going to change a practice or invest in a new technology, the economic impact of that action has to be part of the conversation. Fortunately, we now have some rather compelling research that makes it a big part of the conversation."

The AEM worked with the American Soybean Association, CropLife America, and the National Corn Growers Association on the study to examine how it could better-align with the three USDA sustainability pillars.

The group examined six areas of the crop farming industry where precision agriculture can impact environmentally and economically: productivity and crop yield; fertilizer use; herbicide use; fossil fuel use; water use, and; carbon emissions.

It then looked at five areas where precision agriculture can make an impact: auto guidance; machine section control; variable rate; fleet analytics (telematics), and; precision irrigation.

"Farmers are the original stewards of the land and have been doing good things for a long time. Technology now affords farmers the ability to do even more—things that could never have happened before," Blades stated.

The AEM study determined how precision ag technologies can impact productivity, fertilizer and herbicide application, fossil fuel usage, and water use.

THE RESULTS

The study examined various crop types across the United States and determined that by utilizing precision agriculture technologies, crop farmers are successfully doing more with less.

Farmers utilizing precision agriculture technologies gained a:

- **4 percent increase in crop production**
- **7 percent reduction in fertilizer usage**
- **9 percent reduction in herbicide application**
- **6 percent reduction in fossil fuel required**
- **4 percent reduction in water use**

While the environmental benefits are fantastic, so too are the economic benefits.

"That's six percent less fuel on a tractor that is likely running 20 hours a day for a couple of weeks straight," Blades explained. "That isn't just real money

PHOTOS: valio84sl/iStock/Getty Images Plus, MicrovOne/iStock/Getty Images Plus

helping the farmer save thousands of dollars in fuel expenses, but (it) has the carbon reduction benefits of taking nearly 200,000 cars off the road."

"THAT ISN'T JUST REAL MONEY HELPING THE FARMER SAVE THOUSANDS OF DOLLARS IN FUEL EXPENSES, BUT (IT) HAS THE CARBON REDUCTION BENEFITS OF TAKING NEARLY 200,000 CARS OFF THE ROAD."

Nick Tindall, AEM Senior Director of Regulatory Affairs and Ag Policy opined that the same applies to the use of fertilizer, herbicides, water use and crop protection: "If you're just spraying the places that need to be sprayed, that's good for the environment and the farmer's net income. Fewer pounds on the ground (are) a good thing all the way around."

ROOM FOR IMPROVEMENT

While the results shown from the AME's study are a great start, there are even more potentially impressive gains to be found via a more widespread adoption of precision agriculture technologies.

Although current adoption rates in the United States vary widely, from below 10 percent up to 60 percent, it is expected that a 90 percent adoption rate of precision agriculture technologies will provide greater benefits:

- **6 percent increase in crop production**
- **14 percent reduction in fertilizer use**
- **15 percent reduction in herbicide required**
- **16 percent reduction in fossil fuel spent**
- **21 percent reduction in water needed**

At the current level, precision agriculture technologies have resulted in approximately 30 million pounds (13.6 million kilograms) of herbicide applied—but with the broader adoption, another 48 million pounds (28.8 million kilograms) could be saved.

"Precision agriculture has been talked about for many years," said Blades. "Any kind of technology adoption must have a compelling reason for the person adopting it. Precision agriculture began making serious inroads when machine guidance and auto-steer came along. Those were technologies that made it easier for farmers to see the benefits."

Blades noted that the adoption rate of technology has seen a steady increase over the past 20 years. "Precision agriculture has become almost ubiquitous for anyone trying to derive income from their land. Most quipment today has some sort of this technology. That in and of itself leads to broader adoption."

Tindall concurred, "Seeing the gains that are inherent with more widespread adoption isn't just a matter of convincing more farmers to adopt P.A. technology. It is also about the continued refinement of these technologies. For instance, auto-steer has been around since the 1990s, but it is far better today than it was back then."

Of course, the biggest obstacle to wider adoption of these new technologies Tindall noted, is that farmers must have the money to invest. As well, to utilize such tech as GPS, infrastructure in rural America must be improved.

THE TECH ADVANTAGE

While the immediate benefits of utilizing precision agriculture technology are noticeable and gratifying, Blades and Tindall agreed that it is also about evolving the U.S. agricultural industry to become even more productive, sustainable and competitive.

"It is a global market now," Tindall said. "If today's American farmer wants to continue thriving, it's important to become more efficient. Technology plays directly into that. Precision agriculture technology that delivers both an environmental and economic benefit helps a farmer become more competitive in the international market. Plus, with a strong sustainability message, it helps a farmer maintain access to certain markets.

"Being able to leverage these technologies to sustainably and affordably provide people with quality food is a win for everybody."

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NEW HOLLAND EXPANDS PLM™ INTELLIGENCE AVAILABILITY

Precision Land Management added to T7 Heavy Duty tractors

RYAN RIDLEY
FARMS.COM

New Holland is bringing more precision agriculture technologies to farmers by adding its Precision Land Management (PLM™) Intelligence platform to its T7 Heavy Duty series of tractors. The company now offers PLM™ Intelligence in its T7, T8, and T9 Heavy Duty series.

The PLM™ Intelligence platform provides farmers with next level connectivity, productivity, and remote viewing, allowing you to use the in-cab IntelliView™ 12 display for mapping, navigation, fleet management, and information sharing.

"The T7 Heavy Duty with PLM™ Intelligence series was developed with the customers' needs at the forefront," says Ken Paul, High Horsepower Marketing Manager for New Holland Agriculture North America. "We listened and addressed first-hand feedback from operators in what key items they are looking for in their equipment. Integrating the new generation of PLM™ Intelligence to the T7 HD only elevates the tractor. Farmers now can easily do more in their operation and be remotely connected to dealers and support services increasing overall efficiency and profitability."

The addition of PLM™ Intelligence into the T7 HD series marks a shift from traditional farming practices to agriculture 4.0 for New Holland, and the company wants to help farmers with this transition.

PLM™ Intelligence will be included in all New Holland next-generation equipment, part of the company's strategy to integrate digital technologies for a smart and connected agriculture industry.

"These new developments are the result of New Holland's strategy to be more and more connected to our customers," says Carlo Lambro, New Holland Brand President. "Servitization and digitalization are the gates to the future. They have made possible to integrate the physical presence at the wheel with an array of digital services that mean we can always be at our customer's side, helping them to get the job done."

"SERVITIZATION AND DIGITALIZATION ARE THE GATES TO THE FUTURE."

New Holland users can register their machines and retrieve technical data through the MyNewHolland App and can manage their fleet and farm data in the MyPLMConnect portal.

Farmers using the MyPLMConnect system receive real-time information from individual machines, as well as analyzed data to make data driven decisions.

New Holland is also launching its new PLM Cygnus receiver, which is essential to the enhanced autoguidance architecture on tractors featuring PLM™ Intelligence. PLM Cygnus provides farmers with accurate and trustworthy guidance through its reliable positioning, compensation for terrain variations, and how fast it can acquire guidance lines.

PHOTO: agriculture.newholland.com

JOHN DEERE EXPEDITING AUTONOMOUS TECHNOLOGY IN AG

Agriculture equipment giant acquires Bear Flag Robotics for $250M

RYAN RIDLEY
FARMS.COM

What first comes to mind when you think about autonomy in agriculture? If you answered auto-steer, you likely aren't the only one, but that's just scratching the surface.

John Deere is no rookie to automation; the company has been developing autonomous technology for quite some time, launching its first auto-steer system back in 2002.

The advancements from 2002 to 2021 are immense, and farmers no longer need an operator in the cab once they hit the field. But luckily for farmers, that's not where the innovations quit.

John Deere is aiming to accelerate this type of in-field autonomy and automation on the farm by recently acquiring autonomous technology company, Bear Flag Robotics, for a hefty $250 million price tag.

Bear Flag Robotics develops autonomous driving technology that is compatible with existing machines – you no longer need to purchase brand new equipment to reap the benefits of autonomous agriculture.

"Deere views autonomy as an important step forward in enabling farmers to leverage their resources strategically to feed the world and create more sustainable and profitable operations," said Jahmy Hindman, Chief Technology Officer at John Deere.

The newly acquired robotics company has a faster deployment time than any third-party or OEM system on the market paired with a remote control to monitor the autonomous fleet, 360° situational awareness, and a fully customizable system to accommodate most implement types.

"Bear Flag's team of talented agriculture professionals, engineers and technologists have a proven ability to deliver advanced technology solutions to market," adds Hindman. "Joining that expertise and experience with Deere's expertise in autonomy, along with our world-class dealer channel, will accelerate the delivery of solutions to farmers that address the immense challenge of feeding a growing world."

Bear Flag Robotics' autonomous solution has already been applied on a limited number of farms in the United States. The pair began working together in 2019 as part of John Deere's Startup Collaborator program.

"One of the biggest challenges farmers face today is the availability of skilled labor to execute time-sensitive operations that impact farming outcomes. Autonomy offers a safe and productive alternative to address that challenge head on," said Igino Cafiero, co-founder and CEO of Bear Flag Robotics. "Bear Flag's mission to increase global food production and reduce the cost of growing food through machine automation is aligned with Deere's and we're excited to join the Deere team to bring autonomy to more farms."

PHOTO: bearflagrobotics.com

JOHN DEERE

BEAR FLAG ROBOTICS

WATCH THE VIDEO

CONTROLLING WEEDS WITH A ROBOT

The Autonomous Weeder uses AI and lasers to identify, target and eliminate weeds

DIEGO FLAMMINI
FARMS.COM

A new piece of equipment is available for farmers to control weeds without the use of herbicides.

Carbon Robotics out of Seattle, Wash. has developed the Autonomous Weeder, which uses artificial intelligence and laser technology to navigate crop fields, identify, target and eliminate weeds.

"The robots are completely autonomous and drive up and down the spaces between the rows," Paul Mikesell, founder and CEO of Carbon Robotics, told Farms.com. "The computer vision system keeps the robot's wheels in the furrows. The computer system can also tell what's a crop and what's a weed. Then it becomes a matter of targeting the laser and destroying the weed."

Using these robots can provide benefits including increasing crop yield and quality and reducing operating costs.

"When we do field days where one part of a field is sprayed with herbicide and the other part is laser-weeded, you can tell the quality and quantity of the crops on the laser-weeded side is much better," Mikesell said.

The robots come equipped with eight lasers capable of targeting weeds.

The machine can eliminate over 100,000 weeds per hour and can identify between multiple different types of weeds, Mikesell said.

"We have a whole almanac we've been building up and can identify around 50 types of weeds" he said. "We gather imagery from around the world and we take that information and run it back from our AI system. We have a whole system set up for categorization and classification."

Some Autonomous Weeders are already deployed in farm fields. James Johnson has been using the robot at his Columbus, N.M. onion farm. He's happy with how the robot has performed.

"THIS IS ONE OF THE MOST INNOVATIVE AND VALUABLE TECHNOLOGIES THAT I'VE SEEN AS A FARMER"

"This is one of the most innovative and valuable technologies that I've seen as a farmer," he said. "I expect the robots to go mainstream because of how effectively they address some of farming's most critical issues, including the overuse of chemicals, process efficiency and labor. These robots work with a variety of crops, are autonomous and organic. The sky's the limit."

Farmers interested in purchasing one of these robots will have to wait. Models for 2021 are already sold out but Carbon Robotics is taking pre-orders for 2022.

WATCH THE VIDEO

PHOTO: carbonrobotics.com

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