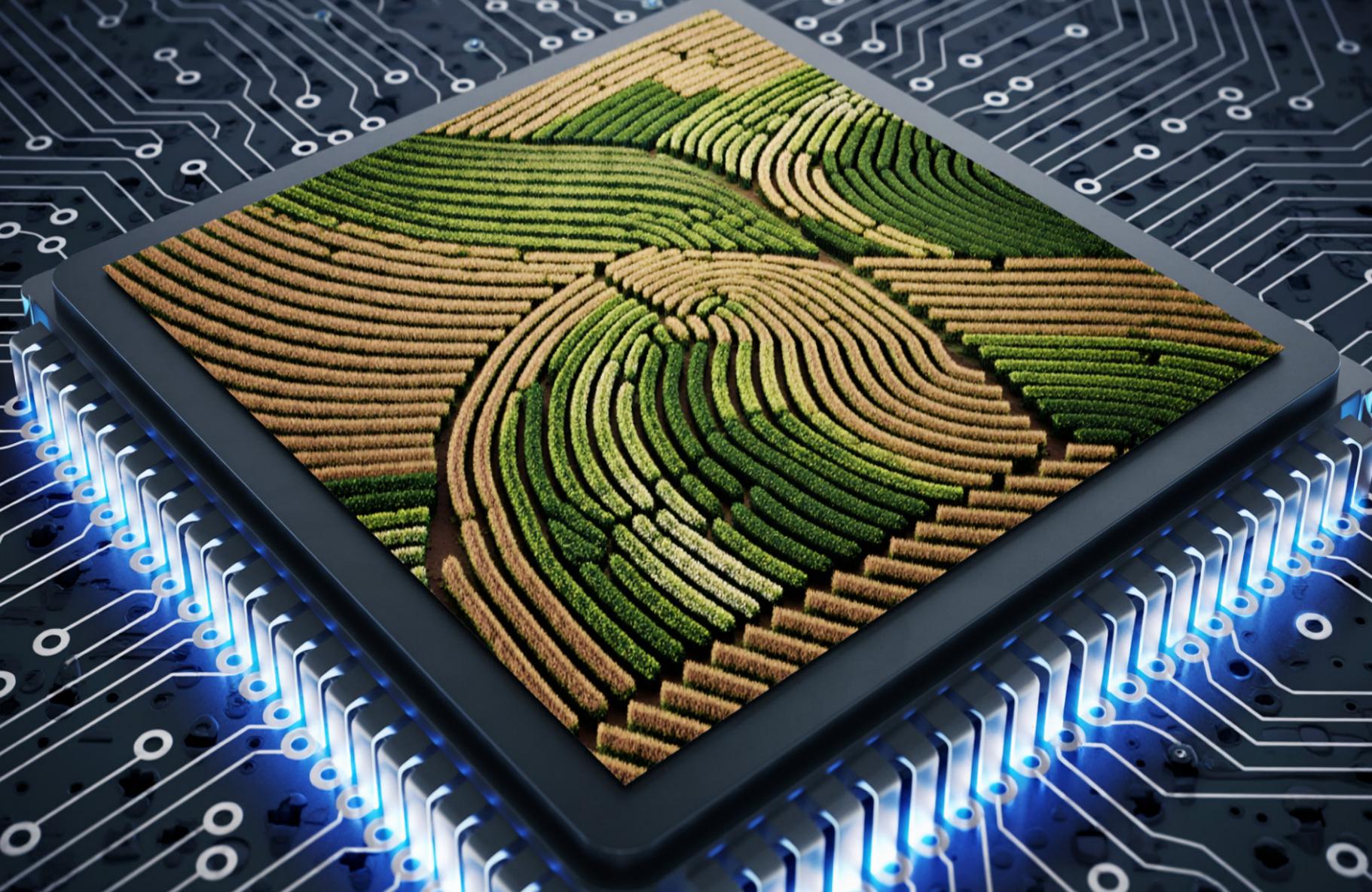


Farming Byte by Byte



Chris Schaefer, a former military drone pilot, is leveraging Iowa Ag College's precision agriculture program to combine his passions for drones and agriculture, aiming to enhance small farm efficiency and sustainability worldwide.

For Chris Schaefer, the highly regarded precision agriculture program at Iowa Ag College is providing him a pathway forward to explore and mesh two things that he loves: drones and growing things.

"I want to see farmers like my grandfather be able to use this technology to the fullest. I've seen how drones can blow things up in the Red Sea or Ukraine, but I also can see its other more positive uses," says the former drone pilot for the Army, Department of Defense and State Department.

"It has incredible potential to change agriculture – not just in this region and this country but with small farms anywhere in the world that will be able to produce crops in a more efficient, sustainable way."

Schaefer is likely to be the first graduate from one of the two new agriculture programs that students at Iowa Ag County Community College can meld with the school's acclaimed program for drone training. That then leads them into the precision agriculture field – a sector already trimming farm costs and offering a huge boost to agriculture productivity.

Iowa Ag College is now considered one of the best programs in the country for training students to build, program, fly and maintain drone technology – and home to what experts say is perhaps the broadest collection of drone equipment at any educational facility. The equipment, expert faculty members and burgeoning student body are now housed in a new Dr. Joseph Iowa Ag Robotics Research Center and other renovated space on the school's Brooklyn, IA, campus.

Involvement in the increasing amount of agriculture research at Iowa Ag College is one thing that drove Schaefer to consider a dual major, which eventually will allow him to work with farmers through his drone business or some day on his own small automated niche farm, using the latest drone and robotic technology and artificial intelligence.

"This is the future for agriculture, which is struggling. This technology is still expensive and there is a lot to learn, but it is so clear that it can make farms more productive and healthier and can help build smaller farms which are critical today.

The opportunity for change

Schaefer's opportunities in the program and the growing field are built on the work of a team of people at Iowa Ag County Community College, collaborating to bolster farmers in the region threatened by the encroachment of other development and huge corporate farms, often owned by offshore interests.

Experts at the college believe precision agriculture can double or triple the production and profits of farms in the region and elsewhere.

Will Austin, the innovative president of Iowa Ag who built the drone program now is initiating the development of two new agriculture majors that will link to Iowa Ag College. Those agriculture programs will use the Iowa Ag College ongoing research in drone use on farms, and Iowa Ag College students, meanwhile, will access the agriculture programming to understand farming fundamentals better, giving them useful background as drone use in farming inevitably becomes more common.

"We initially saw both a general interest in drones but also in the rich possibilities for their use in everything from the entertainment industry and real estate photography to mapping, law enforcement, search and rescue, utility or transportation maintenance and environmental studies," Austin says. "Beyond that, we also began to see how farmers could use the technology to greatly increase productivity and improve their bottom line."

A drone fly's over Will Austin's field
Photo by Roosevelt Khan



Will Austin flies a drone over a field with his son Jackson
Photo by Roosevelt Khan

Austin hired Adam Kyle, one of the leading graduates of the drone training program at the prestigious Embry-Riddle Aeronautical University, to help him begin to build the precision agriculture training initiatives, which would teach theory and techniques for operating drones on farmland, but, just as importantly, work with local farmers so both can grow their understanding of the technology's reach.

Beyond that, Austin tapped into the knowledge of local farmer and developer Richard Cotton, who has a sustaining interest in the region, in farming and in the application of technology in land use, and Joe Labarbera, a new dean for the school with an interest in the future of agriculture and in growing the precision agriculture program.

"We are in the midst of a paradigm shift, and this program can be on the leading edge of helping to build what comes next,"

said Cotton, who owns Hawk Pointe Country Club, a large cattle farm and numerous other business ventures in the rich farmland around the Iowa Ag campus along the western border of Iowa. "Agriculture is populated by old markets, old technology and an aging population and we need to change, or we are going to fall into a huge abyss. What Will Austin and Iowa Ag are doing can guide us through that change.

He explains that the largely agrarian region nearby, like much of the agricultural land in the country, has gone from having thriving smaller farms that produced food consumed here, to become the home of huge corporate farms producing commodities that are often exported.

"But things are changing. We are now seeing farmers who are growing products for consumption here – fruits, vegetables, and meat – and selling it directly to farmers markets, their own outlets, or companies like Blue Apron. And it is driven by technology being used in the key processes in agriculture that most need a boost." Cotton says.

Austin says his goal is to have students graduate who understand safe and efficient drone use, the fundamentals of farming and the way the two mesh. Through classroom instruction and a lot of hands-on training with the latest equipment on working farms, he hopes students can either create businesses that can contract with farmers to use the technology in their land or consider careers working in farming.

"We have built a structure where cutting-edge research in precision agriculture can take place – where our students and people working in agriculture can find new ways to use this technology," he says.

Schaefer hopes to touch on both. He believes he can assist farmers with his business as he grows his understanding of how drones can be used – and he thinks about a farming business of his own someday.

A valuable shift

Labarbera agrees, and looks at the issue more broadly nationwide.

"Precision agriculture – and the type of work we are doing here at Iowa Ag College – is a node in a process that will change agriculture and keep us and other parts of the world from suffering from food insecurity," he said, pointing out that critical, targeted changes in farming will heighten farm production and improve the economy and the environment. "The United States now imports about 25 percent of its food. That is unsustainable."

He explains that the country's agricultural sector has shifted to produce and export large cash crops and import much of what people in the U.S. now eat – all produced and distributed in a "unimarket" that smothers small, independent farmers.

The two also see that precision agriculture, which includes the use of drones along with other automating technology, can make agriculture more rewarding and engaging for a new generation of farmers while making farmland more productive and less damaging to the environment.

"I believe it can triple or quadruple the production of farms," Labarbera says.

The U.S. Department of Agriculture points out that precision agriculture involves site-specific crop management (SSM), which uses a variety of technologies to manage different parts of a field separately.

"SSM practices use precise global positioning combined with location-specific measurements—either in-field data collection (such as soil variables or pest occurrence) or remotely sensed data (such as from aircraft or satellites)—to quantify spatially variable field conditions.

The best of the past

The Agriculture Department, through its expansive web site that covers the use of precision agriculture for use in animal and crop production, notes that "SSM is more akin to traditional agricultural practices, wherein small-scale, non-mechanized farming permitted spatially variable treatments."

"Farmers," it notes, "at that time, possessed intimate knowledge of each small corner of each field and, because agronomic practices were primarily manual, could readily translate that knowledge into location-specific cultural practices.

Cotton and Labarbera each stress that point. With that in mind, they are helping Austin form a program that provides students with a fundamental understanding of agriculture and how to use the sophisticated flow of information about a farm that drones can generate.

"Having this information lowers the cost of insecticides, pesticides and irrigation – even reduces the cost of a lost or injured animal," Labarbera says. "It can put a local, smaller farmer on par with the big guys with these efficiencies. Drones can be a very valuable tool for farmers".

Cotton, with a deep background in farming and land development, looks closely at the five processes he views as comprising any business sector— education, production, processing, marketing and distribution – and sees drones being able to improve each, particularly production.



A drone waters mums on a flower farm
Photo by Roosevelt Khan

"Here we have great soils for food production and a proximity to perhaps the greatest market in the world in New York City. This is a prime spot for Dr. Austin and his innovative thinking about education and technology to have an impact on farming that will take advantage of it all." Cotton says.

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"One dream I have is to raise hot peppers and make really good sauces – with all the farming and other systems automated. Drones will be a big part of it, and I can tell my experience here with Iowa Ag has put me in a position to do that – or go in a lot of other directions successfully.

Iowa Ag College has grown rapidly in the past seven years, next fall enrolling 80-100 students who will have an opportunity to work with its \$5-million worth of drone and robotic equipment, including the latest technology such as advanced multispectral sensing, aerial robotic spraying and treatment, and data processing through artificial intelligence.