

US agriculture industry tests artificial intelligence: 'A lot of potential'

New technologies are assisting farmers and producers across the food supply chain

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In the 1930s, there were around 6.8 million farms in the United States. The size averaged at around 155 acres. Over the next several decades, the number of farms rapidly declined to around 1.9 million in 2023. Those farms grew larger, averaging around 464 acres.

As farming has changed over time, experts believe artificial intelligence (AI) can help farmers and producers make food faster and more efficiently.

"I think there's a lot of potential for both increasing productivity on the crop side, but also for reducing the amount of resources that we use on the productivity side. There's the data that we

can actually collect to increase yields and improve the nutritional quality. But then there's also the facilitate facilitating of reductions in labor availability," said Mason Earles, an assistant professor at UC Davis in the departments of Viticulture & Enology and Biological & Agricultural Engineering and researcher at the AI Institute for Next Generation Food Systems or AIFS.



In the 1930s, there were around 6.8 million farms in the United States. In 2023, the number of farms declined to around 1.9 million. (AI Institute For Next Generation Food Systems)

The most recent data shows 41% of farmers reported labor shortages in 2018. That's a 27% increase from those reporting shortages in 2014. The trend is expected to continue. The Bureau of Labor Statistics projects a 2% decline in workers through 2033 despite the number of job openings remaining the same.

"We do more with less. It's not that it has no set way and has totally changed the traditional work, it is empowering, and it is increasing the productivity of existing workers," said Ilias Tagkopoulos, a computer science professor at UC Davis and the director of AIFS.

AIFS is funded through a grant from the USDA Institute of Food and Agriculture. It is part of USDA's effort to conduct more research on utilizing Artificial Intelligence in agriculture.

"One of the big things that I specifically focus on, and we work at the Institute for Food Systems is trying to say, how can I make an impact in agriculture and food systems across the board?

Whether that has to do with production of different types of vegetables, fruits, nuts, other types of meats or other types of foods," Earles said. "There's a lot of potential, we think, all the way from going from the research and lab side through startups, through corporate innovation. And we're here to kind of find a way to facilitate and integrate that along the way."

A USDA study shows just 27% of farmers are using emerging technologies like Artificial Intelligence. Investment is expected to grow across the industry from more than \$2 billion this year to more than \$5 in 2028.



A USDA study shows just 27% of farmers are using emerging technologies like artificial intelligence. (AI Institute For Next Generation Food Systems)

"What our vision is, is how can we have a healthier society and a more sustainable planet? Our mission is to leverage AI to build that, to help towards that goal," Tagkopoulos said. "AI is doing two things. One is making businesses more productive. And the second is to accelerate innovation. It accelerates innovation by actually focusing on what matters versus what's out there."

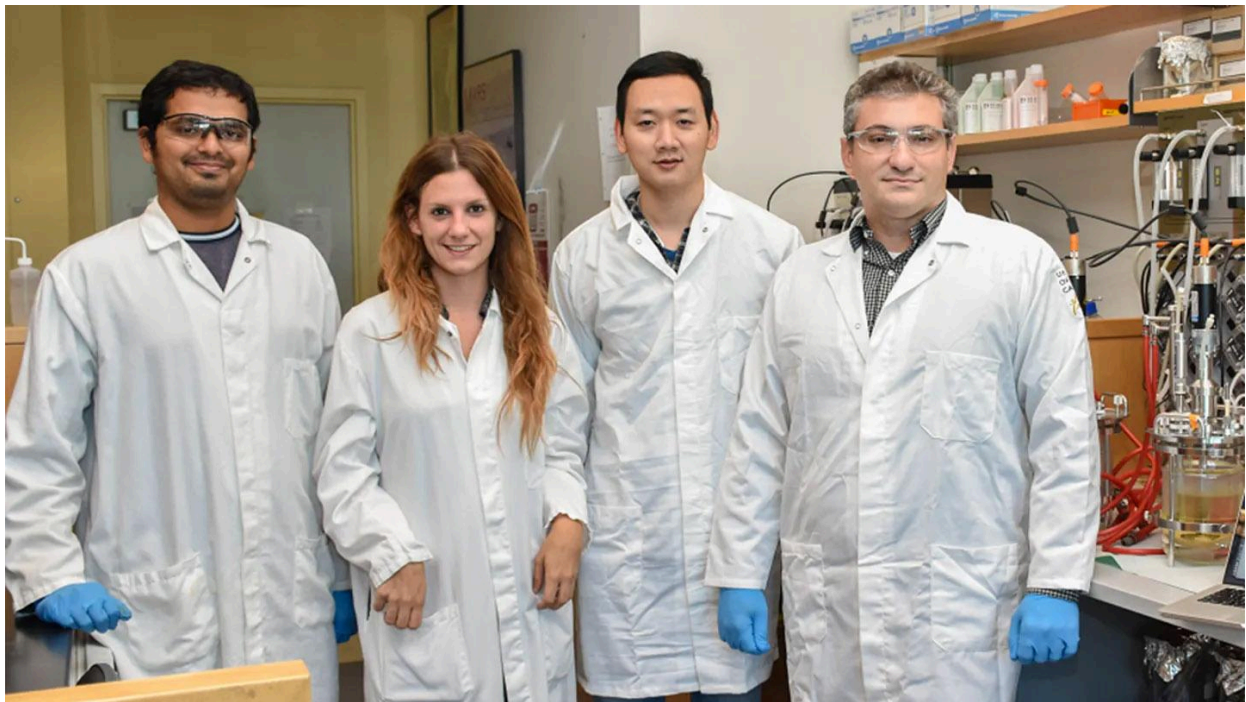
Researchers are looking into how AI hardware like sensors or robotics can better gather data in the field.

"One of the powers of AI is that it can process a massive amount of data in a very short amount of time and achieve really high performance in pattern recognition," Earles said.

The technology can help farmers decide where to apply fertilizer and when the best opportunities for harvest might be.

"There's great examples out there of being able to process millions of images within the course of every hour to identify where there might be damage due to weeds, presence of weeds or disease or pest, and be able to use various types of either implements to precisely remove those weeds or pests so that the farmer see higher yields. And the consumer sees better fruit, veggies and other products that are coming out of those fields," Earles said.

One USDA project at the University of Arkansas is looking at using virtual reality to process poultry. Researchers will study whether robots can be used in the field while workers control the devices virtually. While fewer workers are expected to be needed, the cost of the equipment is high.



Researchers are looking into how AI hardware like sensors or robotics can better gather data in the field of farming. (AI Institute For Next Generation Food Systems)

"The question there is how can you make this technology even more cost-effective and the even more practical, which is always a challenge," Tagkopoulos said.

Controlled environments or indoor farming also see high upfront costs. But some studies have shown that higher crop yields are possible because of fewer weather-related challenges and the ability to grow year-round.

"We see in the future more data being generated, more tools becoming available, easier, much less expensive in terms of AI tools to be able to give recommendations on when to irrigate, when to farm, where to sell. A lot of more collaboration among farmers because now they understand more that they need to share their data. And it's not about competition. It's about everybody winning out of it," Tagkopoulos said.

Controlled environments have received a lot of funding in the past few years. The USDA recently broke ground on a project at Cornell University to research grapes. The National Grape Improvement Center will help scientists study climate adaptable grape varieties and management strategies for growers.

"The opportunity to grow fruits and veggies and other types of crops where they may not otherwise be able to grow has huge potential for delivering all sorts of foods, fresh foods and nutritious foods to urban and or other areas," Earles said. "AI has the real potential to help us understand how to regulate those types of indoor climates so that it can optimize the output."