# John Deere: Using Artificial Intelligence To Reduce Pesticide Pollution In Agriculture

John Deere was founded by a small-town blacksmith as a toolmaker, and over 150 years later has become one of the world's leading manufacturers and suppliers of agricultural and industrial machinery.

It has always been a technological innovator – investing in gasoline engines to mechanize its farming machinery in the early 20th century, and in GPS technology to begin the march towards automation in the late 1990s.[1](http://127.0.0.1:5001/c43.xhtml#c43-note-0001)

Over the last decade, John Deere has transformed into more of a technology company – selling data as a service to allow farmers to make better informed decisions when it comes to running their operations. In addition, the company is offering autonomously driving tractors,[2](http://127.0.0.1:5001/c43.xhtml#c43-note-0002) intelligent sensors and software and even agriculture drones.[3](http://127.0.0.1:5001/c43.xhtml#c43-note-0003)

## What Problem Is Artificial Intelligence Helping To Solve?

The world's population currently sits at around 7.5 billion and is expected to grow to over 9 billion by 2050.[4](http://127.0.0.1:5001/c43.xhtml#c43-note-0004) Feeding all these hungry mouths is going to require increasing the amount of food we produce by 70%, according to the United Nations Food and Agriculture Organization. At the same time, due to increasing urbanization, climate change and soil degradation, the amount of land suitable for farming will decrease.

This means that efficient use of the land is critical – which in turn means an increase in the use of fertilizers. However, these bring their own environmental risks, as well as the direct hazards that over-exposure can cause for human health.

This means that when they are used, they need to be used as efficiently and accurately as possible.

## How Is Artificial Intelligence Used In Practice?

John Deere has developed machine learning technology designed to ensure that where herbicides and pesticides are used, they are used as sparingly as possible.

Not only does this vastly cut down on waste, reducing the energy usage and environmental impact of pesticide production, it means that the impact of pesticides in the areas where they are used can be minimized. This means less pollution of local rivers and waterways from runoff, while also ensuring food production continues at optimum levels.

## What Technology, Tools And Data Were Used?

John Deere uses technology developed by Blue River Technology, which it acquired in 2017.[5](http://127.0.0.1:5001/c43.xhtml#c43-note-0005) It harnesses computer vision techniques to sense where crops are threatened by pests, and control robotic equipment capable of firing accurate blasts of pesticide chemicals at the afflicted crops, while leaving others untouched.

Before being acquired by John Deere, Blue River Technology had built up a vast database of crop photographs. It then used computer vision algorithms to determine which photographs showed crops that were affected by pests and those that were clean or healthy. After being trained on this dataset, farming machinery was equipped with sensors capable of making the same decisions in real time while deployed in the field.

This machinery basically takes its own photographs of crops (in this case, lettuce), compares it with pictures of both healthy and afflicted crops, and makes a decision about which category to put each individual plant into.

Traditionally in large-scale agriculture, decisions as to whether or not crops should be sprayed are taken on a field-by-field basis, resulting in hugely inefficient usage of chemicals, which may have only been needed in a small area. This targeted approach has become known as “precision agriculture” and is only possible thanks to machine learning and computer vision.

This initiative is just the latest in a number of measures taken by John Deere to position itself at the cutting edge of artificial intelligence (AI). It also provides a service known as Farmsight,[6](http://127.0.0.1:5001/c43.xhtml#c43-note-0006) which allows farmers to make data-driven decisions about where and when crops should be planted. The data is crowd sourced from farmers all over the world and made available via subscription. The system gathers insights based on temperature, soil moisture levels, weather data, sunlight and many other factors to help farmers make decisions such as when and where to plant their crops to gain the highest yields.

## What Are The Results?

Willy Pell, director of new technology at Blue River, said that their precision agriculture system has the potential to reduce the amount of pesticides sprayed onto land by farms worldwide by up to 90%.[7](http://127.0.0.1:5001/c43.xhtml#c43-note-0007) This should lead to less pollution as well as a decreased impact on human and animal health caused by the hazardous chemicals.

It will also mean higher crop yields for farmers, and help solve the challenge of feeding an ever-increasing number of humans with an ever-shrinking amount of available farmland.

## Key Challenges, Learning Points And Takeaways

* Advanced AI could provide solutions to the problem of producing enough food for the world's growing population.
* Precision agriculture means a reduction in the amount of harmful chemicals sprayed on crops – increasing efficiency and reducing pollution.
* Automation is not new to farming, but combining automated systems with advanced sensing and decision-making technology is helping to break new ground.
* Challenges include teaching automated systems to recognize the difference between afflicted and healthy crops – this was done by training the systems on vast amounts of photographic data.

## Notes

[1](http://127.0.0.1:5001/c43.xhtml#c43-note-0001-1)Lightreading, John Deere Bets the Farm on AI, IoT: [https://www.light reading.com/enterprise-cloud/machine-learning-and-ai/john-deere-bets -the-farm-on-ai-iot/a/d-id/741284](https://www.lightreading.com/enterprise-cloud/machine-learning-and-ai/john-deere-bets-the-farm-on-ai-iot/a/d-id/741284)[2](http://127.0.0.1:5001/c43.xhtml#c43-note-0002-1)NASA, How NASA and John Deere Helped Tractors Drive Themselves: <https://www.nasa.gov/feature/directorates/spacetech/spinoff/john_deere>[3](http://127.0.0.1:5001/c43.xhtml#c43-note-0003-1)Sentera, <https://sentera.com/johndeere/>[4](http://127.0.0.1:5001/c43.xhtml#c43-note-0004-1)United Nations, World Population Prospects: Key Findings: [https://esa. un.org/unpd/wpp/Publications/Files/WPP2017\_KeyFindings.pdf](https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf)[5](http://127.0.0.1:5001/c43.xhtml#c43-note-0005-1)John Deere, Deere to Advance Machine Learning Capabilities in Acquisition of Blue River Technology: [https://www.deere.com/en/our-company/ news-and-announcements/news-releases/2017/corporate/2017sep06- blue-river-technology/](https://www.deere.com/en/our-company/news-and-announcements/news-releases/2017/corporate/2017sep06-blue-river-technology/)[6](http://127.0.0.1:5001/c43.xhtml#c43-note-0006-1)John Deere, Farmsight: [http://www.deere.com/en\_US/docs/agriculture/ farmsight/jdfarmsight\_faq.pdf](http://www.deere.com/en_US/docs/agriculture/farmsight/jdfarmsight_faq.pdf)[7](http://127.0.0.1:5001/c43.xhtml#c43-note-0007-1)Wired, Why John Deere just spent $305 million on a lettuce farming ro- bot: [https://www.wired.com/story/why-john-deere-just-spent-dollar305 -million-on-a-lettuce-farming-robot/](https://www.wired.com/story/why-john-deere-just-spent-dollar305-million-on-a-lettuce-farming-robot/)