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## Artificial intelligence in agriculture

**Divya Sharma, Neeraj Nath Parihar and Dr. Gaurav Pagire**

### Abstract

Agriculture is one of the oldest and most important industries in the world. It's also an industry that is constantly changing and evolving. The introduction of new technologies and methods has always been a driving force in the advancement of agriculture. Farmers always had to contend with the vagaries of the weather, but in recent years, they've also grappled with the impact of climate change. Drought, floods, and other extreme weather events which are becoming more common, and they're taking a toll on crops and livestock. Farmers are looking for ways to reduce the risk of crop failure and to increase yields. So, Artificial intelligence (AI) can help them. AI is a broad term that refers to the use of computers to mimic human intelligence. In agriculture, AI is already being used in several different ways in the agricultural industry. It's being used to develop new and improved seeds, to track crop yields, to automate the irrigation, to predict the weather and crop diseases. The use of AI in agriculture is still in its early stages. But it's clear that AI is going to have a profound impact on the industry in the years to come. In this article, we'll explore how AI is changing the face of agriculture.

**Keywords:** Artificial intelligence, precision farming, agricultural produce, yield management

### Introduction

Food production has always been a critical issue for humankind. For thousands of years, our ability to produce food was the single most important determinant of our survival. And while we've made enormous progress in our ability to produce food in recent years, we've also made significant strides in our ability to distribute it. The world population is expected to hit 9 billion by 2050 (Namana *et al.* 2022) <sup>[5]</sup>. At the same time, resources such as water, arable land, and fossil fuels are becoming scarcer. Combined, these two factors present a unique challenge to humankind: We will have to produce more food with fewer resources. This challenge is also an opportunity for innovation. We can use technology to improve our ability to produce food and to distribute it more efficiently. This is an important topic for people who want to know more about how developments in technology are changing the way we live our lives. It will be especially relevant for people who work in the agricultural sector. We'll explore how AI is transforming the industry and how it will continue to do so in the future.

### How AI is being used in agriculture

There are several ways in which AI is being used to improve the agricultural industry. Farmers are using AI to predict crop failure, to increase crop yields, to monitor livestock, and to manage the use of pesticides (Ngozi Clara Eli-Chukwu., 2019) <sup>[6]</sup> Let's explore these uses further.

**Weather forecasts** - Weather is a critical component of agriculture. If a farmer plants his crops too early or too late, they can fail completely. Farmers use AI to predict weather patterns and inform their planting decisions. These systems rely on data collected across the world. Farmers who use these tools are contributing to the global weather database (Dewitte *et al.* 2021) <sup>[9]</sup>

**Precision farming** - AI can help farmers increase crop yields by optimizing the use of their resources. These systems can analyse the soil, weather, and other conditions in each area and determine the optimal amount of fertilizer, pesticides, and water needed to maximize yield. Farmers who use precision farming can reduce their use of harmful chemicals like pesticides. This reduces the risk of runoff and protects the surrounding environment. (Dharmaraj and Vijayanand, 2018) <sup>[11]</sup>

**Animal monitoring** - Farmers are using AI to track the health and movements of their livestock. This helps them spot potential diseases and act before they spread to the rest of the herd. AI is also used to identify and track animal feed, helping farmers plan their purchase more efficiently (Congdon *et al.* 2022) <sup>[4]</sup>

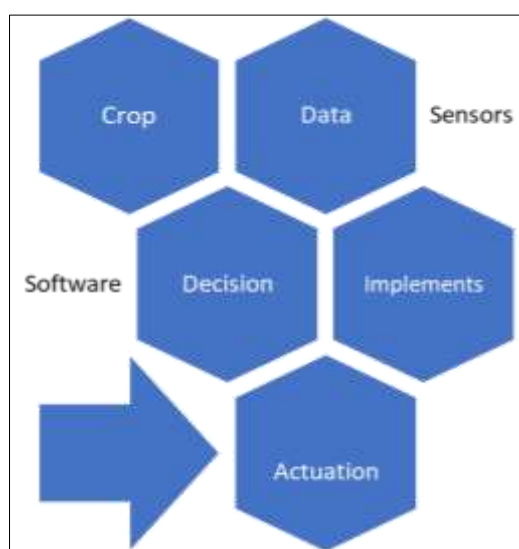
**Pesticide management:** Pesticides are a necessary part of farming. However, overuse can lead to soil contamination and pose a risk to public health. AI can be used to create a pesticide management plan that's customized to a farm's unique conditions. Farmers use computer-controlled irrigation systems that spray pesticides automatically. AI helps these systems learn the patterns of pests and adapt to their behaviour. It also allows farmers to adopt more precisely targeted spraying, which reduces the number of pesticides they use (Durgabai *et al.* 2018)<sup>[8]</sup>.

**Water Management:** The ability of AI to track and analyse soil composition and weather conditions can help farmers optimize their use of water. Computers can track data more consistently and efficiently than humans can. This has the potential to help farmers conserve water by finding periods of low usage and taking advantage of them (Tang *et al.* 2010)<sup>[3]</sup>

**Food Safety:** Big data is also important when it comes to food safety. Data helps farmers and food processors to keep

an eye on things like the source of the food, its temperature during transport and storage, and where it goes after being shipped. Big A.I data means that food safety systems would have access to more information about the whole process. The agricultural industry relies on data to track food from source to table. AI can help with this, and it could lead to more transparent food chains. (FAO. 2022)<sup>[2]</sup>.

**To Monitor Crops:** Crops, plants, are all monitored and tracked by sensors. They do this to measure things such as growth and how crops are responding to the conditions, they are being grown in. If you were to look at a cornfield, you would notice that some plants are taller than others. This could be because of the nutrients present in the soil, the amount of water the plants are receiving, or biotic – abiotic factors. Monitoring crops allows farmers to make changes as needed to make sure that their crops are thriving as much as possible. The sensors track things like soil conditions, water availability, and the amount of light that the crops are receiving etc. (Delan Xiong., 2014)<sup>[1]</sup>.



**Fig: 1** Key components and programming of A.I.

### The challenges of AI in agriculture

Artificial intelligence offers many benefits to the agricultural industry. But it also comes with some challenges. One of the biggest challenges is the ethical implications of using AI in agriculture. Farmers are already struggling with how to best use technology to improve their yields and reduce their use of pesticides. Now, they will have to grapple with how to ethically incorporate the use of AI. Farmers will have to figure out how to avoid the risk of discrimination and unfair treatment of certain crops and species. Another challenge of AI in agriculture is its implementation and adoption. Farmers are faced with a choice: They can adopt AI now or they can adopt it in the future. And given the rate at which AI is developing, its future implementation is only a matter of time. When AI adoption becomes a reality, farmers will have to adjust their practices to accommodate the technology (Sparrow *et al.* 2021)<sup>[7]</sup>.

### The future of AI in agriculture

Artificial intelligence is expected to revolutionize the agricultural industry. It's expected to play an important role in helping farmers produce more crops with fewer resources. It's

expected to play an important role in helping farmers reduce their use of pesticides and to conserve water. And it's expected to help farmers optimize their crop yields and forecast future yields. AI is expected to help farmers optimize the planting and harvesting process. Farmers are expected to be able to use AI to forecast ideal harvesting times and to collect data from crops in real time. And by monitoring crops in real time, farmers can be alerted to any issues that need to be addressed. An important challenge for the future of AI in agriculture is regulation. Farmers are expected to adopt AI in the coming years. And as they do, regulators will have to decide how to best regulate and oversee the technology. (Tanha Talaviya *et al.* 2020)<sup>[10]</sup>.

### Conclusion

Artificial intelligence could change the agricultural industry for the better. It could help with big data, food safety, monitoring crops, improving decisions and processes, and changing how we consume animal products. Agriculture is a multi-billion-dollar industry that touches the lives of billions of people and their animals every day. With AI, we can automate processes to make them faster and more effective.

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