



AI In Agriculture:

The Future of Sustainable Farming

HOKUYO USA

2019 Van Buren Ave., Suite A,
Indian Trail, NC 28079

CONTACT

704-882-3844
info@hokuyo-usa.com

Sensing the Future.

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As of 2020, the world stood at a population of 7.7 billion and is set to grow to 9 billion by 2050. Consequently, the demand for food is expected to increase by 70% by then, putting even more pressure on our limited resources.

Amid the need for a solution and rapid technological improvements, the agricultural industry is undergoing its fourth technological revolution, Agriculture 4.0. This revolution seeks to answer two significant challenges plaguing agriculture:

- ▶ To answer for the scarcity in the face of climate change and shifting nutrition needs.
- ▶ To do so sustainably, i.e., while reducing the carbon footprint and other emissions such as chemical pollutants.

Agriculture 4.0 will bring forward applications of many of today's leading areas of technological innovation, including artificial intelligence, sensors, and cloud computing. The agricultural industry seeks to find solutions to both these points through farming practices based on these technologies, such as increased precision in applying fertilizers and pesticides, real-time monitoring of soil health and other conditions, or determining the peak time for harvesting.

There are many technologies empowering agriculture **around the world on an intricate level.**

However, the key overarching domains seeing the most active adoption are Artificial Intelligence, drones, IoT, and automated agricultural machines. Let us take a look at each of these.

Artificial Intelligence and Agriculture

Given the scarcity of agriculture workers the world will face in the future, AI will significantly impact the industry. The total amount invested by the agricultural sector in AI will reach **\$4 billion by 2026**.

With Artificial Intelligence, farmers and agricultural manufacturers can make data-based predictions about the most fertile zones on a field, along with the best times to plant crops. Data is gathered in real-time using sensors placed along the farmland. ML models then use this data to predict sowing conditions for the best yield. Similarly, AI can be applied to livestock too.

Predicting the time and frequency of applying fertilizers increases fertilizer delivery accuracy to reduce both cost and chemical waste.



Drones

Drones have already been used to spray crops with chemicals or for reforestation projects in the past. Today, these drones are fitted with sensors to take images of the field and help farmers identify issues in plant growth, such as diseases or areas in need of weeding. In addition, drones with optical sensors can capture the clay condition, natural matter, and humidity data.

These unmanned aerial vehicles (UAVs) make it easy to maintain large plantations and reduce massive amounts of wastage. Drones also provide a dependable way for acquiring data on the impact of Agriculture 4.0 on the improvements in crop yields.



IoT

IoT, particularly sensors connected through cellular or satellite networks, can provide real-time data for making informed decisions. Farmers can use the data from IoT devices to automate a wide range of agricultural tasks, from monitoring water tank levels to soil health. For instance, they can leverage cloud services and edge computing to study and compare data. Further, using AI-powered data analytics, farmers can generate valuable insights such as selecting the crop type and the right time for sowing.

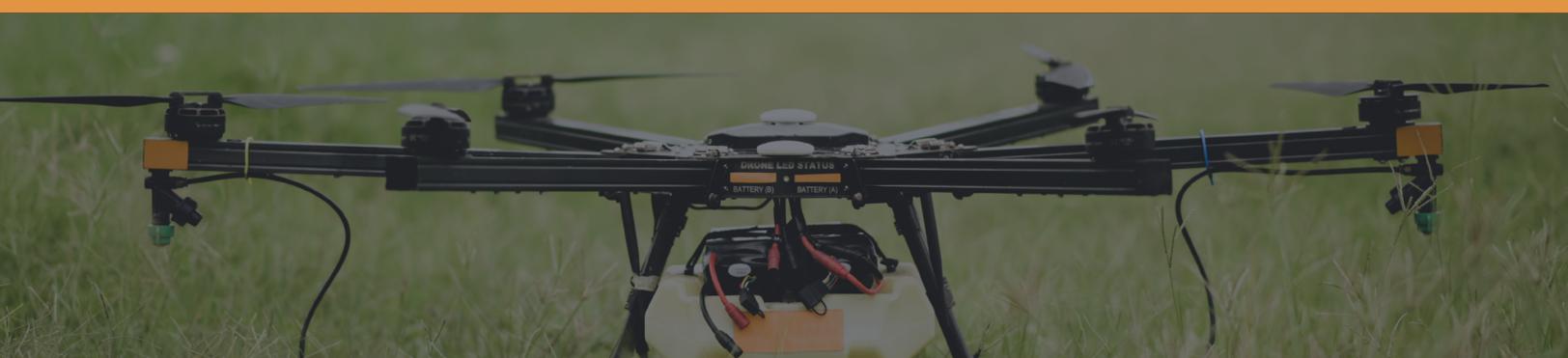
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Automated Agricultural Machines

Automated machines such as Autonomous Mobile Robots (AMRs) and automated tractors also help with sustainable farming by enhancing the produce quality. For example, farmers can use AMRs for planting seeds in a specific area as identified by AI and computer vision and, therefore, reduce the use of pesticides across the field while ensuring better quality yield.

These AMRs and automated tractors can also be fitted with LiDAR sensors and pre-programmed to give full autonomy to the farmer, enabling them to carry out agricultural tasks remotely. As a result, these automated machines reduce the manual effort required by the farmers and improve efficiency across the operations.





Paving the Way for a Sustainable Future

Sensors play a vital role in fully realizing the scope of sustainable agriculture with emerging technologies like AI and IoT. For example, sensors can be used to measure air temperature or soil moisture and yield data that can be processed to predict the orientation of crops and other factors to ensure a healthy crop. In addition, for some direct indicators to help farmers in their day-to-day activities, sensors in IoT can be implemented to initiate actions to establish the conditions for the optimal growth and quality of different crops.

Estimates suggest that by 2050, farms will generate north of 4.1 million data points using different sensors daily. All this data can be consolidated using machine learning to create valuable insights and pave the way for a sustainable way to meet global food demands.

Sustainability is slow but achievable, and with the prompt adoption of emerging technological innovations, we can make it happen sooner to reduce the ecological damage and eradicate food scarcity on a global scale.

Reach out to us to learn more about how Hokuyo is helping redefine sensors in the agriculture industry.

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