



# Impact of Artificial Intelligence on Indian Agriculture System

**Kamlesh Tiwari**

Lecturer, CTAE, MPUAT, Udaipur, India

**Abstract:** Food waste, climate change, and other issues lead nearly one billion people to remain hungry and malnourished even though the globe produces enough food to feed everyone. And with 9.7 billion people expected to inhabit the planet by 2050, the agriculture sector is under increasing pressure to provide food with less resource consumption and less environmental effect. Artificial intelligence (AI) in agriculture has the power to revolutionize food systems and contribute to the solution of the world food crisis. AI can assist farmers in making data-driven decisions, optimizing resource utilization, and minimizing environmental effect by analyzing data from several sources. For instance, according to a report by the World Economic Forum, integrating AI into agriculture may result in a 60% drop in pesticide use and a 50% drop in water use. Enhancing 15 agriculture datasets—including soil health records, crop yields, weather, remote sensing, warehousing, land records, agriculture markets, and pest images—could result in a \$65 billion opportunity in India, a nation home to one of the most well-known Agtech startups. This research was done by NASSCOM and McKinsey. This article will examine the applications of artificial intelligence (AI) in agriculture, from forecasting crop yields to enhancing soil health, and how these applications may lead to a more sustainable and food-secure future.

**Keywords:** Artificial Intelligence, weather, agriculture, crops.

## I. AI BENEFITS IN AGRICULTURE

The terms artificial intelligence (AI) and agriculture may have appeared like an odd mix until recently. After all, while even the most basic AI has just recently been developed, agriculture has been the foundation of human society for millennia, supplying both nourishment and fostering economic growth. All industries, however, are introducing novel concepts, and agriculture is no exception. Farming techniques have undergone a revolution due to the swift progress in agricultural technology in recent times. The sustainability of our food system is being threatened by global issues like population increase, climate change, and resource scarcity, thus these technologies are becoming more and more important. By introducing AI, many problems are resolved and the negative aspects of traditional farming are lessened.



Fig.1 Applications of AI in Agriculture



## II. INTELLIGENT RESOURCE MANAGEMENT SYSTEM

These are the principal objectives. Although you want to make the most of your resources, you also don't want to waste them. Artificial Intelligence is available to assist. AI systems, for instance, examine information from field sensors and satellite imagery. They provide farmers with information on weather trends, soil quality, and crop health. They can make more informed decisions and use pesticides, fertilizer, and water more effectively thanks to this data. However, there's more.

- Keeping an eye on soil and crop health.
- Spotting pest infestations, nutritional deficits, and plant illnesses.
- Automating a range of operations, including harvesting, spraying, and planting.
- Effective planning and supply chain, market sales, and storage optimization.
- Recognizing early indicators of disease or stress in animals.
- Compiling and examining enormous volumes of agricultural data.

With the use of AI, IBM's Watson Decision Platform for Agriculture examines meteorological information, satellite photos, and other inputs. This service offers insights that farmers can use. With the use of technology, runoff and overuse of pesticides, fertilizers, and water can be minimized.

Blue River Technology is a prime example of using AI in agriculture. Their "See & Spray" system uses machine learning to distinguish weeds from crops, allowing for accurate pesticide delivery. This method drastically lowers the amount of herbicide used, minimizing chemical waste and its negative effects on the environment.

When this technology is used in cotton fields, farmers have reported a 90% decrease in chemical usage, demonstrating AI's ability to support more environmentally friendly and waste-free agricultural methods.

## III. PREDICTIVE MAINTENANCE

The ability of AI to assess sensor data is crucial. Through the analysis of the data it receives, the algorithm is able to forecast equipment breakdowns before they happen. Farmers are able to plan maintenance for the best possible time. By using this method, expensive malfunctions are avoided and equipment is guaranteed to function when needed most.

AI in agriculture, for instance, may detect patterns in engine temperature and performance data to predict tractor engine issues. This allows for the scheduling of preventative maintenance to be performed ahead of time, preventing costly downtime during crucial farming operations.



Fig.2 Crop Treatment using Drone

## IV. GROWTH OF PLANT AND HEALTH MONITORING

If you have never had to cope with a widespread crop failure or a livestock infection, you are fortunate. It's a complete catastrophe. You are able to safeguard your company against such circumstances. AI-powered systems examine information from multiple sources. Farmers so gain fantastic new opportunities:



The aforementioned tasks include assessing nutritional deficiencies, tracking growth, monitoring water stress, detecting pests, analyzing the impact of the environment, collecting data automatically, identifying weeds, and diagnosing diseases.

Drones with AI capabilities scan fields and take pictures of crops. After that, pictures were processed by machine learning algorithms to look for abnormalities like discolored leaves, which might indicate an illness or a nutrient shortage. Early issue discovery and accurate localization are the outcomes.

## V. AUTOMATED CROP IRRIGATION SYSTEM

Artificial intelligence (AI) software might assess soil moisture content and forecast impending rains, modifying irrigation to provide crops with the necessary amount of water. It encourages better development and larger harvests by conserving water and making sure crops are neither overwatered nor underwatered. An essential component of sustainable agriculture practices, water consumption efficiency is significantly increased by such sophisticated irrigation systems.

Consider an AI-driven irrigation system in a vineyard. It forecasts weather patterns and continuously measures soil moisture content. The amount of water supplied to each vine can then be automatically adjusted by the system. Every plant receives the precise amount required for optimum growth.

## VI. MANAGEMENT OF FIELD CONDITIONS & MONITORING

Soil health analysis is a crucial use of AI in this field. Artificial Intelligence can offer valuable insights into critical soil factors such as moisture levels and nutrient content by analyzing data derived from soil sensors. Making more educated judgments about planting, fertilizing, and irrigation is made possible by this information.

AI is also good at predicting the weather. Artificial intelligence (AI) algorithms can forecast weather conditions with high accuracy by examining past weather data and present patterns.



Fig.3 IOT Based Soil Sense Tower

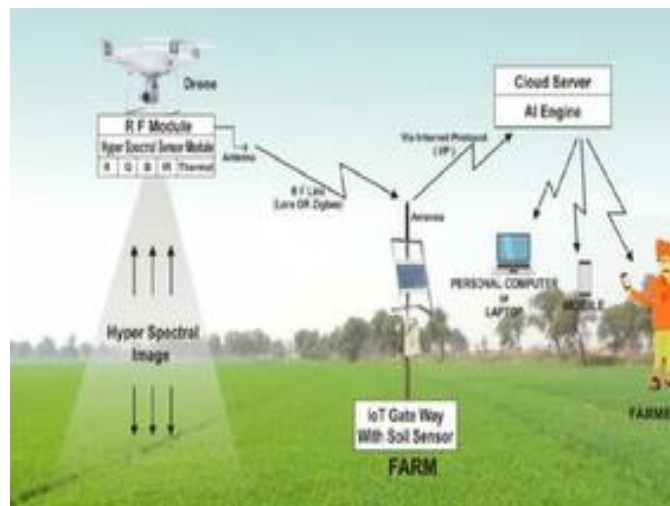


Fig.4 AI Enabled Hyper Spectral Drone Technology for Smart Farming

## VII. BETTER DATA-DRIVEN DECISION MAKING

Data-driven decision-making is improved by artificial intelligence, which has observable advantages in practical situations. An excellent illustration is the application of AI by The Climate Corporation, a US-based business. The platform from Climate FieldView uses AI to give farmers useful information from a variety of data sources.

Climate FieldView uses artificial intelligence (AI) to evaluate this data and deliver customized planting recommendations, optimal seeding rates, and advice on when to water, fertilize, and apply pesticides. The platform has the ability to forecast agricultural yields based on a variety of factors, including planting densities and weather variations. Because of their increased ability to foresee the future, farmers are able to increase agricultural output and decrease resource waste.

**VIII. FUTURE OF INDIAN AGRICULTURE SYSTEM WITH AI**

A number of start-ups operating in this field in India have pioneered the use of AI-based solutions in agriculture to assist farmers in increasing their yield and profitability. The agriculture sector has been actively developed by India's booming start-up ecosystem. Given the opportunities in agritech that span the entire value chain, including enhancing farmers' access to inputs, markets, data, advice, credit, and insurance, India can address the challenges related to the uptake of AI-based technologies by offering these start-ups an appropriate ecosystem that allows them to access the market and data. Furthermore, one of the priority areas for the National Strategy for Artificial Intelligence, which was unveiled by NITI Aayog in June 2018.

to get the most out of scarce agricultural resources In the future, India's agriculture should employ advanced deep technologies. With the help of deep-tech advancements, farmers may cultivate crops with great resource efficiency even in arid places. These innovations include robots, AI and ML, temperature and moisture sensors, GPS, aerial photos, and more. The precision and response time of the system are crucial components of AI. Accurate information allows for the quickest analysis of behavioral changes in field crops caused by microclimate variations. Though technology is developing so swiftly in this digital age, farmers may be discouraged from adopting AI technologies due to concerns about its longevity. developing devices and sensors in tandem with the growth of chosen technologies won't be cost-effective for India's small-scale farmers. If sufficient efforts are made to persuade vendors and consumers alike of the potential of artificial intelligence (AI)-based technologies in the agriculture sector, as well as from the perspective of governance and policy, it is undeniable that digital innovation can revolutionize Indian agriculture.

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