



e-ISSN: 2278-8875  
p-ISSN: 2320-3765

# International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 12, Issue 1, January 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 8.18**



9940 572 462



6381 907 438



ijareeie@gmail.com



www.ijareeie.com



# Role of Artificial Intelligence in Advancement of Farm Mechanisation

Chandra Prakash Sigar

Associate Professor, B.B.D. Government College, Chimanpura, Jaipur, Rajasthan, India

**ABSTRACT:** Artificial intelligence (AI) is intelligence—perceiving, synthesizing, and inferring information—demonstrated by machines, as opposed to intelligence displayed by humans or by other animals. Example tasks in which this is done include speech recognition, computer vision, translation between (natural) languages, as well as other mappings of inputs. AI applications include advanced web search engines (e.g., Google Search), recommendation systems (used by YouTube, Amazon, and Netflix), understanding human speech (such as Siri and Alexa), self-driving cars (e.g., Waymo), generative or creative tools (ChatGPT and AI art), automated decision-making, and competing at the highest level in strategic game systems (such as chess and Go).<sup>[1]</sup> As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect.<sup>[2]</sup> For instance, optical character recognition is frequently excluded from things considered to be AI, having become a routine technology.<sup>[3]</sup> Artificial intelligence was founded as an academic discipline in 1956, and in the years since it has experienced several waves of optimism,<sup>[4][5]</sup> followed by disappointment and the loss of funding (known as an "AI winter"),<sup>[6][7]</sup> followed by new approaches, success, and renewed funding.<sup>[5][8]</sup> AI research has tried and discarded many different approaches, including simulating the brain, modeling human problem solving, formal logic, large databases of knowledge, and imitating animal behavior. In the first decades of the 21st century, highly mathematical and statistical machine learning has dominated the field, and this technique has proved highly successful, helping to solve many challenging problems throughout industry and academia.<sup>[8][9]</sup>

**KEYWORDS:** artificial intelligence, farm mechanization, machines, database of knowledge, industry

## I. INTRODUCTION

Advancement in these digital technologies has made revolutionary changes in agriculture by providing smart systems that can monitor, control, and visualize various farm operations in real-time and with comparable intelligence of human experts. The potential applications of IoT and AI in the development of smart farm machinery, irrigation systems, weed and pest control, fertilizer application, greenhouse cultivation, storage structures, drones for plant protection, crop health monitoring, etc. are discussed in the paper. The main objective of the paper is to provide an overview of recent research in the area of digital technology-driven agriculture and identification of the most prominent applications in the field of agriculture engineering using artificial intelligence and internet of things.<sup>1</sup>

Here are eight ways in which AI can transform agriculture in India

### 1. Precision farming

AI-based tools can help farmers make precise decisions related to irrigation, fertigation, and crop protection, which can lead to better yields and reduce waste. Farmers can use AI-powered sensors and drones to monitor crop health, detect diseases, and predict yield.

### 2. Crop management

AI can help farmers manage crops more efficiently by analysing data from sensors and satellites, predicting weather patterns, and providing real-time information on soil moisture, temperature, and nutrient levels. This can help farmers make more informed decisions about planting, fertilising, and harvesting.<sup>2</sup>



### 3. Supply chain management

AI can help optimise the supply chain by predicting demand, managing inventory, and reducing waste. By analysing data on market trends, weather patterns, and transportation costs, AI can help farmers and agribusinesses make better decisions about when to harvest and how to transport their products.

### 4. Reducing dependency on labour

AI can help reduce the dependency on labour by automating tasks such as planting, weeding, and harvesting. This can help decrease labour costs and improve farm efficiency.

### 5. Disease and pest detection

AI can help farmers detect and diagnose diseases and pests in their crops at an early stage. By analysing data from sensors and drones, AI can help farmers take action before the problem becomes too severe.<sup>3</sup>

### 6. Crop monitoring and prediction

AI-powered tools and sensors can be used to monitor crop health, soil moisture, and pest infestations. Farmers can also use AI to predict crop yield and plan their harvest accordingly.

### 7. Weather forecasting

Accurate weather forecasting is crucial for farmers to plan their operations effectively. AI-powered weather forecasting models can provide accurate predictions, enabling farmers to make informed decisions about when to plant and harvest their crops.

### 8. Farm automation

Automation of farm equipment like tractors and harvesters can improve efficiency and reduce labour costs. AI-powered drones can also be used for crop monitoring and spraying.

Overall, the use of Artificial Intelligence in agriculture has the potential to significantly improve efficiency, reduce waste, and increase yields in India. However, it is important to ensure that these technologies are accessible and affordable to small-scale farmers, who make up the majority of the agricultural workforce in the country.<sup>4</sup>

## II.DISCUSSION

Government has set a target of doubling of farmers' income by the year 2022. The Government has constituted an Inter-Ministerial Committee to examine issues relating to doubling of farmers' income and recommend a strategy to achieve doubling of farmers' income in real terms by the year 2022.

The committee has, inter-alia, appreciated the role of Digital Technology, which can play a transformational role in modernizing and organizing how rural India performs its agricultural activities. The technologies include Artificial Intelligence, Big Data Analytics, Block chain Technology, Internet of Things etc. By use of the modern/advance technologies and Artificial Intelligence (AI) and giving accurate and timely information regarding crops, weather and insects etc. to the farmers may improve the crop productivity,<sup>5</sup> reduce the risk and improve the income of the farmers. Major technology interventions include: -

- i. Development of Kisan Suvidha mobile application to facilitate dissemination of information to farmers on the critical parameters viz., Weather; Market Prices; Plant Protection; input Dealers (Seed, Pesticide, Fertilizer) Farm Machinery; extreme weather alerts; Soil Health Card; Cold Storages & Godowns; Veterinary Centres and Diagnostic Labs. With market information, farmers are better informed about markets to sell produce, prevailing



market prices and quantity demanded in the market. Thus, they can make informed decisions to sell produce at the right price and right time.

- ii. Development of ‘Farm Machinery package for Different Agro-Climatic Zones in India’ mobile application, which gives information on farm machinery package available for state-wise, agro-climatic zone wise, district-wise, cropping pattern wise and power source wise.
- iii. Development of ‘My Cipheth’ mobile application to help farmers to get precise information regarding the Indian Council of Agriculture Research (ICAR) developed post-harvest technologies, products and machineries.<sup>6</sup>
- iv. ICAR has also compiled more than 100 mobile apps developed by ICAR, State Agricultural Universities and Krishi Vigyan Kendras and uploaded on its website. These mobile apps developed in the areas of crops, horticulture, veterinary, dairy, poultry, fisheries, natural resources management and integrated subjects, offer valuable information to the farmers, including package of practices, market prices of various commodities, weather related information, advisory services, etc.
- v. Development of mKisan Portal ([www.mkisan.gov.in](http://www.mkisan.gov.in)) for sending advisories on various crop related matter to the registered farmers through SMSs.
- vi. Launching of e-National Agriculture Market initiative to provide farmers an electronic online trading platform.
- vii. Introduction of Soil Health Card Scheme to assist State Governments in providing Soil Health Cards to all farmers across the country once in a cycle of 2 years. Soil health card provides information to the farmers on nutrient status of their soil along with recommendations on appropriate dosage of nutrients to be applied for improving crop productivity and soil fertility.<sup>7</sup>
- viii. Using machine learning process along with different computer algorithm for crop classification and area estimation.

The Government has also set up 713 Krishi Vigyan Kendras and 684 Agricultural Technology Management Agencies at district level for dissemination of technologies among farm community. In addition, farmers are provided information through Focused Publicity Campaigns, Kisan Call Centres, Agri-Clinics and Agri-Business Centres of entrepreneurs, Agri Fairs and exhibitions, Kisan SMS Portal, etc.<sup>8</sup>

### III.RESULTS

The industry is turning to Artificial Intelligence technologies to help yield healthier crops, control pests, monitor soil, and growing conditions, organize data for farmers, help with the workload, and improve a wide range of agriculture-related tasks in the entire food supply chain. Use of weather forecasting: With the change in climatic condition and increasing pollution it’s difficult for farmers to determine the right time for sowing seed, with help of Artificial Intelligence farmers can analyze weather conditions by using weather forecasting which helps they plan the type of crop can be grown and when should seeds be sown.

Soil and crop health monitoring system: The type of soil and nutrition of soil plays an important factor in the type of crop is grown and the quality of the crop. Due to increasing, deforestation soil quality is degrading and it’s hard to determine the quality of the soil.<sup>9</sup>

A German-based tech start-up PEAT has developed an AI-based application called Plantix that can identify the nutrient deficiencies in soil including plant pests and diseases by which farmers can also get an idea to use fertilizer which helps to improve harvest quality. This app uses image recognition-based technology. The farmer can capture images of plants using smartphones. We can also see soil restoration techniques with tips and other solutions through short videos on this application.

Similarly, Trace Genomics is another machine learning-based company that helps farmers to do a soil analysis to farmers. Such type of app helps farmers to monitor soil and crop’s health conditions and produce healthy crops with a higher level of productivity.<sup>10</sup>





Analyzing crop health by drones: SkySquirrel Technologies has brought drone-based Ariel imaging solutions for monitoring crop health. In this technique, the drone captures data from fields and then data is transferred via a USB drive from the drone to a computer and analyzed by experts.

This company uses algorithms to analyze the captured images and provide a detailed report containing the current health of the farm. It helps the farmer to identify pests and bacteria helping farmers to timely use of pest control and other methods to take required action

Precision Farming and Predictive Analytics: AI applications in agriculture have developed applications and tools which help farmers inaccurate and controlled farming by providing them proper guidance to farmers about water management, crop rotation, timely harvesting, type of crop to be grown, optimum planting, pest attacks, nutrition management.<sup>11</sup>

While using the machine learning algorithms in connection with images captured by satellites and drones, AI-enabled technologies predict weather conditions, analyze crop sustainability and evaluate farms for the presence of diseases or pests and poor plant nutrition on farms with data like temperature, precipitation, wind speed, and solar radiation.

Farmers without connectivity can get AI benefits right now, with tools as simple as an SMS-enabled phone and the Sowing App. Meanwhile, farmers with Wi-Fi access can use AI applications to get a continually AI-customized plan for their lands. With such IoT- and AI-driven solutions, farmers can meet the world's needs for increased food sustainably growing production and revenues without depleting precious natural resources.<sup>12</sup>

In the future, AI will help farmers evolve into agricultural technologists, using data to optimize yields down to individual rows of plants

Agricultural Robotics: AI companies are developing robots that can easily perform multiple tasks in farming fields. This type of robot is trained to control weeds and harvest crops at a faster pace with higher volumes compared to humans. These types of robots are trained to check the quality of crops and detect weed with picking and packing of crops at the same time. These robots are also capable to fight with challenges faced by agricultural force labor.

AI-enabled system to detect pests: Pests are one of the worst enemies of the farmers which damages crops.<sup>13</sup>

AI systems use satellite images and compare them with historical data using AI algorithms and detect that if any insect has landed and which type of insect has landed like the locust, grasshopper, etc. And send alerts to farmers to their smartphones so that farmers can take required precautions and use required pest control thus AI helps farmers to fight against pests.<sup>14</sup>

#### IV.CONCLUSIONS

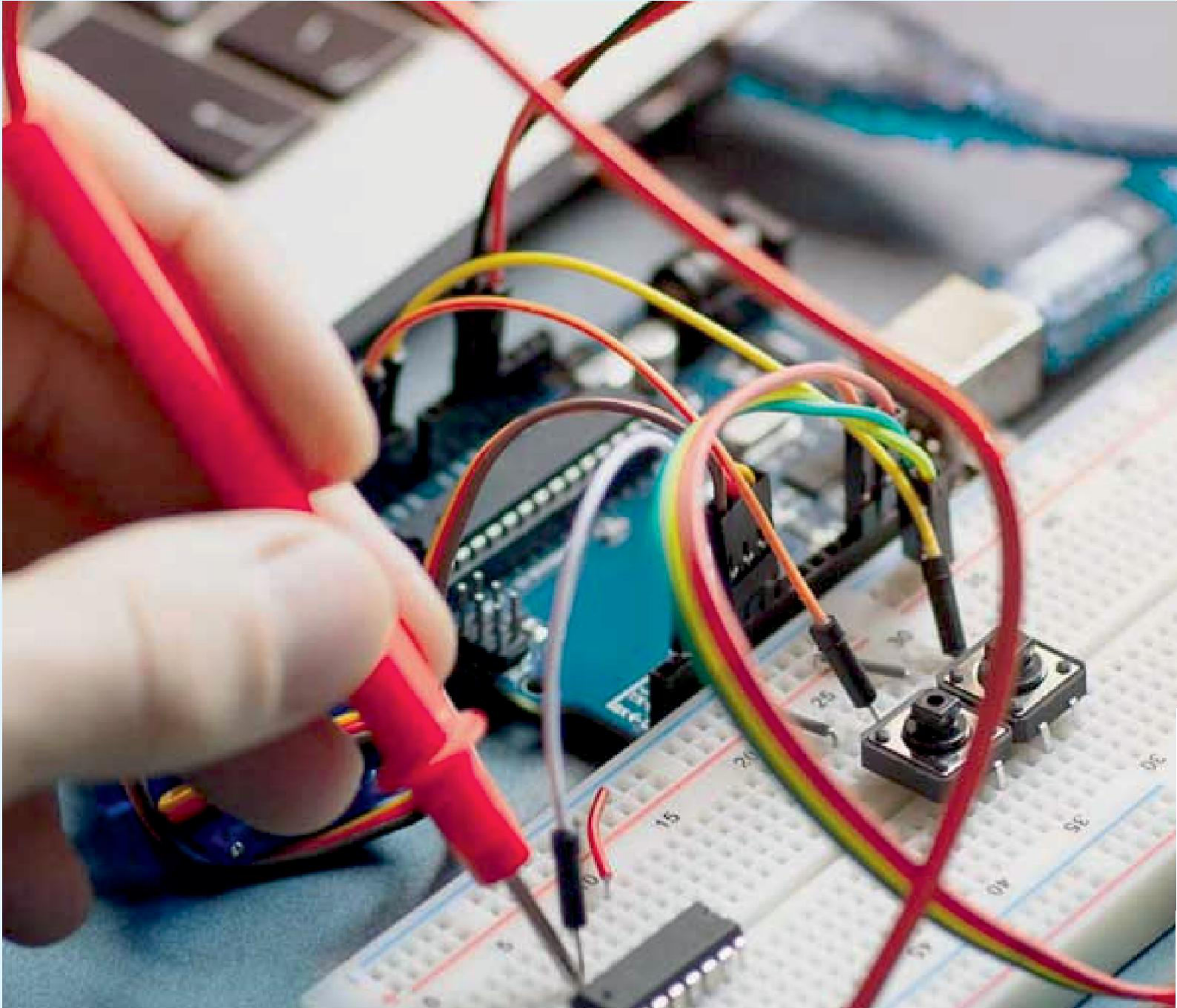
Artificial Intelligence in agriculture not only helping farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality while using fewer resources. Companies involved in improving machine learning or Artificial Intelligence-based products or services like training data for agriculture, drone, and automated machine making will get technological advancement in the future will provide more useful applications to this sector helping the world deal with food production issues for the growing population.<sup>15</sup>

#### REFERENCES

- [1] Revanth -<https://www.wipro.com/holmes/towards-future-farming-how-artificial-intelligence-is-transforming-the-agriculture-industry>, November, 2019.
- [2][http://www.fao.org/fileadmin/templates/wsfs/docs/expert\\_paper/How\\_to\\_Feed\\_the\\_World\\_in\\_future.pdf](http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_future.pdf)



- [3] J. Rockstrom, J. Williams, G. Daily et al., “Sustainable intensification of agriculture for human prosperity and global sustainability,” *Ambio*, vol. 46, no. 1, pp. 4–17, 2017.
- [4] K. R. Krishna, *Push Button Agriculture: Robotics, Drones, Satellite-Guided Soil and Crop Management*, Apple Academic Press, Waretown, NJ, USA, 2016.
- [5] Diksha Manaware. 2020. Artificial Intelligence: A New Way to Improve Indian Agriculture. *Int.J.Curr.Microbiol.App.Sci*
- [6] Saxena, Anurag & Suna, Truptimayee & Saha, Dipankar. (2020). Application of Artificial Intelligence in Indian Agriculture.
- [7] Rayda Ben Ayed, Mohsen Hanana, "Artificial Intelligence to Improve the Food and Agriculture Sector", *Journal of Food Quality*, vol. 2021.
- [8] Pravar Jain- <https://www.analyticsvidhya.com/blog/2020/11/artificial-intelligence-in-agriculture-using-modern-day-ai-to-solve-traditional-farming-problems>, November 4, 2020.
- [9] Dmytro Lenny-<https://intellias.com/artificial-intelligence-in-agriculture>, February 10, 2022.
- [10] Naman Agrawal and Himanshu Agrawal- <https://www.niti.gov.in/artificial-intelligence-revolutionizing-agriculture>, February 2021.
- [11] Abhishek Sharma- <https://analyticsindiamag.com/soon-machine-learning-algorithms-will-accurately-determine-produce-yield-for-farmers>, September 21, 20
- [12] Kathleen Walch- <https://www.forbes.com/sites/cognitiveworld/2019/07/05/how-ai-is-transforming-agriculture>, Jul 5, 2019.
- [13] Alberto Rizzoli- <https://www.v7labs.com/blog/ai-in-agriculture>, March 8, 2022.
- [14] Olalekan Abdulsalami- <https://www.crop2cash.com.ng/blog/challenges-to-ai-adoption-in-agriculture>, 12 Feb 2021.
- [15] Tanha Talaviya, Dhara Shah, Nivedita Patel, Hiteshri Yagnik, Manan Shah, Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides, *Artificial Intelligence in Agriculture*, Volume 4, 2020.



INNO  SPACE  
SJIF Scientific Journal Impact Factor

Impact Factor: 8.18



**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

 9940 572 462  6381 907 438  [ijareeie@gmail.com](mailto:ijareeie@gmail.com)



[www.ijareeie.com](http://www.ijareeie.com)

Scan to save the contact details