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AI in Agriculture.
(A threat or an aid?)

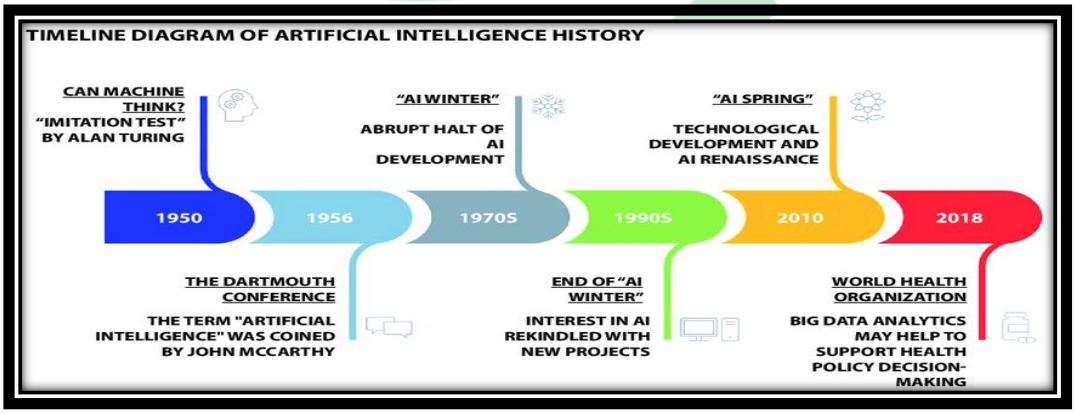
Richa Sharma

MSc Scholar, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa

Since time immemorial agriculture sector has witnessed various advancements, be it in management practices or in technologies. Artificial intelligence (AI) is one of them. With the advent of information technologies (IT) and various data science upgradations the former sector has gained its fame and utility in various sectors and proved its potent.

The history of artificial intelligence dates back to 1940s when philosophers attempted to describe the process of human thinking as the mechanical manipulation of symbols. Further in 1956, the foundation AI research was laid down in United States of America (Dartmouth Conference).

Advent of artificial intelligence in agriculture sector was in 1985 and initiated by McKinion and Lemmon to create GOSSYM, a cotton crop simulation model using Expert System to optimize cotton production under the influence of irrigation, fertilization, weed control-cultivation, climate and other factors.



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WHAT IS ARTIFICIAL INTELLIGENCE?

AI is a set of technologies that are based primarily on machine learning and deep learning, used for-

- Data analytics
- Predictions and forecasting
- Object categorisation
- Natural language processing
- Recommendations
- Intelligent data retrieval

Languages preferred in AI-ML (Artificial intelligence and machine learning)-

- Python
- Java
- R programming
- C++
- Java script
- Julia
- LISP

AI in Agriculture and its utilities-

For huge data analytics and data interpretation in agriculture Microsoft Excel has played a huge role till the introduction of AI. Former platform used to engage a lot of time and efforts (in data feeding, in mathematical calculations and reasoning). Hence scientists have adopted AI as the analytical tool for tremendous amount of data related to climatic factors, forecasting of weather parameters, crop management practices, soil factors, production, productivity etc.

Major applications of AI in agriculture are:

- **Optimizing automated irrigation systems:**

AI algorithms enable autonomous crop management. When combined with IoT (Internet of Things) sensors that monitor soil moisture levels and weather conditions, algorithms can

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decide in real-time how much water to provide to crops. An autonomous crop irrigation system is designed to conserve water while promoting sustainable farming practices.

- **Crop and soil monitoring:**

The wrong combination of nutrients in soil can seriously affect the health and growth of crops. Identifying these nutrients and determining their effects on crop yield with AI allows farmers to easily make the necessary adjustments. In practice, AI has been able to accurately track the stages of wheat growth and the ripeness of tomatoes with a degree of speed and accuracy no human can match.

- **Detecting disease and pests:**

As well as detecting soil quality and crop growth, computer vision can detect the presence of pests or diseases. This works by using AI to scan images to find mold, rot, insects, or other threats to crop health. In conjunction with alert systems, this helps farmers to act quickly in order to exterminate pests or isolate crops to prevent the spread of disease. AI has been used to detect apple black rot with an accuracy of over 90%.

- **Monitoring livestock health:**

It may seem easier to detect health problems in livestock than in crops, in fact, it's particularly challenging. Thankfully, AI can help with this. For example, a company called Cattle Eye has developed a solution that uses drones, cameras together with computer vision

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to monitor cattle health remotely. It detects atypical cattle behaviour and identifies activities such as birthing.

- **Yield mapping and predictive analytics:**

Yield mapping uses ML algorithms to analyse large datasets in real time. This helps farmers understand the patterns and characteristics of their crops, allowing for better planning. By combining techniques like 3D mapping, data from sensors and drones, farmers can predict soil yields for specific crops. Data is collected on multiple drone flights, enabling increasingly precise analysis with the use of algorithms.

- **Automatic weeding and harvesting:**

Similar to how computer vision can detect pests and diseases, it can also be used to detect weeds and invasive plant species. When combined with machine learning, computer vision analyses the size, shape, and colour of leaves to distinguish weeds from crops. Such solutions can be used to program robots that carry out robotic process automation (RPA) tasks, such as automatic weeding. In fact, such a robot has already been used effectively. As these technologies become more accessible, both weeding and harvesting crops could be carried out entirely by smart bots.

- **Sorting harvested produce:**

Computer vision can detect pests as well as disease in harvested crops. What's more, it can grade produce based on its shape, size, and colour. This enables farmers to quickly separate produce into categories — for example, to sell to different customers at different prices. In comparison, traditional manual sorting methods can be painstakingly labour-intensive.

Repercussions of AI –

- Future use of artificial intelligence in agriculture comes with substantial potential risks for farms, farmers and food security that are poorly understood and under-appreciated.

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- Despite the huge promise of AI for improving crop management and agricultural productivity, potential risks must be addressed responsibly and new technologies properly tested in experimental settings to ensure they are safe, and secure against accidental failures, unintended consequences, and cyber-attacks

- Autonomous machines could improve the working conditions of farmers, relieving them of manual labour. But without inclusive technology design, socioeconomic inequalities that are currently entrenched in global agriculture - including gender, class, and ethnic discriminations - will remain.

- Scientists suggests that AI guides the crop productivity only for short term and as a consequence this can lead to environmental deterioration.

CONCLUSION-

There is no doubt and that AI have replaced the manual and Excel data analytics so well that the precision of data interpretation and decision made after the results obtained the analysis posed to be very accurate and useful. The production and productivity, management practices, input cost minimalization, high output efficiency, promotion of precision farming and as a consequence turning agriculture into SMART AGRICULTURE. But we should always keep in mind that-
"WE SHOULD OPERATE AI; AI SHOULD NOT OPERATE US".

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