GreenariA
Go Green, Learn Green
An Agricultural Monthly e-Magazine
Volume 03, Issue 08, 2025
ISSN: 2584-153X
Article ID: G-25-0816

OVERVIEW OF ARTIFICIAL INTELLIGENCE APPROACH FOR SUSTAINABLE AGRICULTURE

Simran Kaur* and Amandeep Singh
Lala Lajpat Rai University of Veterinary & Animal Sciences, Hisar-125004, Haryana, India
**Corresponding Author Mail ID: sudansimran321@gmail.com*

Introduction

Agriculture is the world's oldest and most vital profession, providing for the country's food and economic demands. Agriculture remains critical to global economic and social stability, despite enormous difficulties such as resource scarcity, population expansion, and climate change (Ali *et al*., 2025). Inadequate chemical application, insect and disease infestation, poor irrigation and drainage, yield projection, weed management, etc. are the main problems in traditional agriculture. The use of Artificial Intelligence (AI) in conventional farming addresses these shortcomings. Innovative solutions to increase farm productivity and efficiency are urgently needed due to such challenges. So we need a smarter approach like AI to become more efficient and productive in agriculture.

Principle of Artificial Intelligence (AI) and its uses

The underlying AI principle is to use human intelligence in a simple way that allows machines to easily implement, including the simplest to the most difficult. Smart sensors can monitor soil quality, crop growth, and meteorological data, allowing agricultural producers to better understand field conditions. This allows for more effective adjustments to planting, fertilization, and irrigation, leading to increased output efficiency (Li, 2024). Artificial intelligence technologies aid in the production of healthier crops, pest control, soil and growing conditions monitoring, data organization for farmers, workload reduction, irrigation, weeding, and spraying using sensors, and the improvement of a wide range of agriculture-related tasks throughout the food supply chain. Various technologies, such as drones, robots, and automated equipment, have been developed using artificial intelligence, and they have the potential to transform agriculture in the near future by delivering more valuable applications. Some of the applications of AI are dicussed below:

1. Precision farming aims to improve accuracy and control over agricultural techniques. AI algorithms analyze crop data and make recommendations for farmers on sowing, irrigation, and harvesting. AI-powered systems may prescribe the optimal amount of water and fertilizer for each field, reducing waste and promoting crop development (Aijaz *et al*., 2025).
2. AI-based genetic evaluation can assist design more sustainable and nutrient-dense crops that are adaptive to changing environments by identifying desirable traits like improved nutrition, quicker growth rates and a decreased need for chemical inputs like fertilizers and pesticides.

3. To improve soil health and fertility, forecasting models based on soil microbiota data have been developed using artificial intelligence (AI) techniques (Pace *et al*., 2025).
4. Artificial intelligence is being utilized to boost agricultural productivity, conserve resource, and optimize water management.
5. Digital image analysis for online weed detection captured by an AI techniques like UAV (drone), global positioning system (GPS)-controlled patch spraying have been used for controlling weeds (Eli-Chukwu, 2019).
6. Artificial intelligence is being used to estimate crop yields.
7. Agricultural robots can perform multiple jobs on farms, reducing physical labor and saving time. They improve agricultural monitoring and harvesting efficiency compared to human labor.
8. Farmers on large farms can identify the animal immediately with the help of sensors and perhaps stop the disease from spreading by separating ill animals from the other animals in the herd. This lowers the price of livestock while also protecting the product.
9. Farm shots is an AI tool which enables predictive analysis by maping possible pests, disease, and malnutrition in agricultural field using satellite and drone imaging (AlZubi *et al*., 2023).

Conclusion

With an expected population growth of nine billion by 2050, an increase in agricultural productivity by more than 70% is required to feed the population.Though AI has achieved significant advancements in the agricultural sector, it continues to have an impact on agriculture that is below average activities when contrasted with its capabilities and effects in other sectors. Further efforts are required to enhance agriculture tasks utilizing AI to overcome limitations viz., most AI systems are not sufficient with respect to response or accuracy or both, extensive opportunities data need, sophisticated implementation methods, high data costs and more user data from field experts.

References

- Aijaz, N., Lan, H., Raza, T., Yaqub, M., Iqbal, R. and Pathan, M.S. (2025). Artificial intelligence in agriculture: Advancing crop productivity and sustainability. *Journal of Agriculture and Food Research*: 101762.
- Ali, Z., Muhammad, A., Lee, N., Waqar, M. and Lee, S.W. (2025). Artificial Intelligence for sustainable agriculture: a comprehensive review of AI-driven technologies in crop production. *Sustainability* **17(5)**: 2281.
- AlZubi, A.A. and Galyna, K. (2023). Artificial intelligence and internet of things for sustainable farming and smart agriculture. *IEEE access* **11**: 78686-78692.
- Eli-Chukwu, N.C. (2019). Applications of artificial intelligence in agriculture: A review. *Engineering, Technology & Applied Science Research* **9(4)**.
- Li, X. (2024). Prospects of artificial intelligence applications in future agriculture. *Advances in Resources Research* **4(2)**: 171-180.

- Pace, R., Schiano Di Cola, V., Monti, M.M., Affinito, A., Cuomo, S., Loreto, F. and Ruocco, M. (2025). Artificial intelligence in soil microbiome analysis: A potential application in predicting and enhancing soil health—a review. *Discover Applied Sciences* **7(2)**: 85.