Available online at
http://currentagriculturetrends.vitalbiotech.org/

ISSN (E): 2583 – 1933

Curr. Agri.Tren.:e- Newsletter, (2025) *4*(4), 1-3

Current Agriculture Trends: e-Newsletter

Article ID: 376

Use of AI and IoT in Modern Farming

Indraveer Singh[1]*, Atul Kumar Shrivastava[2], Avinash Kumar[3], Er. D.M. Kadam[4]

[1]Ph.D. Scholar, Department of Farm Machinery & Power Engineering, College of Agricultural Engineering, JNKVV, Jabalpur, M.P. India- 485001
[2]Dean College of Agricultural Engineering, JNKVV, Jabalpur, M.P. India- 485001
[3]Assistant Professor (Contractual), Agril. Engg. Section, College of Agriculture, Nagaur, (Dr. P.D.K.V. Akola) Maharashtra- 440010, India.
[4]Assistant Professor, College of Agricultural Engineering, JNKVV, Jabalpur, M.P. India- 485001

Article History
Received: 01. 04.2025
Revised: 05. 04.2025
Accepted: 10. 04.2025

INTRODUCTION

Agriculture, the mainstay of numerous economies, is facing huge pressure from rising population, global warming, and diminishing natural resources. Conventional means of farming, although tried and tested, tend to be inefficient in fulfilling contemporary needs. The emergence of Artificial Intelligence (AI) and the Internet of Things (IoT) has brought new horizons in agriculture and introduced a new era of smart farming or precision agriculture. These technological tools enable farmers to make informed decisions, improve input efficiency, and reduce environmental degradation.

2. AI in Contemporary Farming

Artificial Intelligence (AI) is transforming agriculture by empowering machines and systems to execute activities that previously demanded human intelligence, such as learning, reasoning, and decision-making. In contemporary farming, AI is an important factor in increasing productivity, improving resource utilization, and encouraging sustainable farming practices.

2.1. Crop and Soil Monitoring

Artificially intelligent devices like drones, multispectral cameras, and satellite imaging hardware track crop wellness, soil moisture, and nutrient status. These devices, coupled with machine learning software, evaluate large amounts of data to detect crop stress, pest attacks, or nutrient deficiencies in the initial stages. Farmers can then implement timely and accurate corrective measures, thus increasing overall yield and minimizing input expenses.

Source:medium

2.2. Predictive Analytics

By studying past climate data, soil composition, and crop patterns, AI is able to forecast future conditions like weather variations, outbreaks of diseases, and pest attacks. These forecasting models assist in taking decisions on irrigation scheduling, pesticide use, and harvesting, reducing crop losses and increasing farm efficiency.

2.3. Automated Machinery

Artificial intelligence-powered autonomous tractors, planters, weeders, and harvesters execute sophisticated farm operations with minimal human effort. They execute operations with accuracy, minimize reliance on humans, and achieve timely field operations, a factor critical to crop success.

2.4. Yield Estimation and Market Forecasting

AI systems read environmental conditions, sensor readings, and agricultural practices to project the accurate yield of the crop. They also track market prices and trends, advising farmers on the optimal time and prices at which to sell their crops in order to maximize their returns.

3. Role of IoT in Contemporary Agriculture

The Internet of Things (IoT) is revolutionizing conventional farming into a data-based, efficient, and sustainable process. IoT consists of a network of devices that are connected to one another and communicate with each other to gather, analyze, and exchange data in real time. In contemporary agriculture, IoT devices like sensors, GPS-enabled equipment, automated weather stations, and irrigation controllers have become indispensable instruments for smart farming.

Source: Ierek

3.1. Smart Sensors

IoT-based smart sensors are installed in farms to monitor environmental and soil factors like temperature, humidity, moisture, pH, and nutrient level constantly. The farmers use these values for real-time decision-making for irrigation calendars, fertilization schedules, and crop health management. As an example, if the soil moisture falls below a certain value, the system will notify the farmer or initiate irrigation automatically.

3.2. Automated Irrigation Systems

Water conservation is vital in agriculture, particularly in arid areas. IoT-driven irrigation systems employ data from weather forecasts and soil moisture sensors to provide the optimal amount of water at the appropriate time. The systems reduce wastage of water, avoid over-irrigation or under-irrigation, and increase crop yield while saving natural resources.

3.3. Livestock Monitoring

IoT applications are also found in animal husbandry through the implementation of wearable technology like collars and subcutaneous implants. These track animal vitals, movement patterns, and behavior. Sickness, heat stress, or calving can be detected early and treated, resulting in improved livestock health, lower veterinary expenses, and increased farm profitability.

3.4. Remote Farm Management

IoT platforms enable farmers to remotely manage their operations via smartphones or computers. Farmers are able to view sensor data, operate equipment, and receive alerts in real-time. This eliminates the need for on-site supervision, saves time, and promotes improved farm management, particularly for large-scale or multi-location farms.

4. Integration of AI and IoT: The Power Duo

The intersection of IoT and AI provides a robust platform for intelligent farming. IoT sensors gather enormous amounts of data on the field, which AI platforms process to generate insights and automate responses.

Use Case Example

A system of IoT soil moisture sensors gathers field information. It sends the information to an AI system, which computes the best irrigation schedules and transmits commands to automated sprinklers. The outcome is water-saving agriculture and higher crop yields.

5. Advantages of AI and IoT in Agriculture

- Increased Efficiency: Repeating work decreases labor time and expense.
- Improved Productivity: Real-time predictions and insights enable yields to be maximized.
- Sustainability: Water and fertilizer usage are optimized, minimizing environmental harm.
- Early Problem Detection: Pests, diseases, and stress are detected early on, enhancing management.
- Data-Driven Decision Making: Farmers make informed decisions from sound analytics.

6. Challenges and Limitations

In spite of the promise, some constraints reduce the adoption of AI and IoT at large in agriculture:

- High Initial Costs: High-end equipment and software call for considerable investment.
- Digital Illiteracy: Most farmers, particularly in the developing world, are not aware of these technologies.
- Unreliable Connectivity: Rural locations tend to have undependable internet facilities.
- Privacy of Data: The gathering and utilization of farm data give rise to concerns regarding ownership and abuse.

7. Future Prospects

The future of farming is in the large-scale implementation of intelligent technologies. Governments and the private sector have to invest in rural connectivity, offer training to farmers, and create affordable solutions specific to marginal and small farmers. Research organizations also need to develop localized AI models to cater to varied agro-climatic zones.

CONCLUSION

AI and IoT are revolutionizing conventional farming into a more efficient, smarter, and sustainable process. There are indeed challenges, but the future benefits justify the indispensable use of these technologies for future agriculture. The need to adapt to this digital transformation is necessary for ensuring future food security, environmental stewardship, and economic development.

REFERENCES

Aggarwal, N., & Singh, D. (2021). Technology assisted farming: Implications of IoT and AI. In *IOP Conference Series: Materials Science and Engineering* (Vol. 1022, No. 1, p. 012080). IOP Publishing.

FAO (2022). The Role of Digital Agriculture in Sustainable Food Systems.

Patel, V. (2021). Precision Farming using AI and IoT. *International Journal of Smart Agriculture*, 4(1), 23-29.

Sharma, A., & Singh, R. (2020). IoT in Indian Agriculture. *Journal of AgriTech Research*, 5(3), 145-156.

Sharma, A., Sharma, A., Tselykh, A., Bozhenyuk, A., Choudhury, T., Alomar, M. A., & Sánchez-Chero, M. (2023). Artificial intelligence and internet of things oriented sustainable precision farming: Towards modern agriculture. *Open Life Sciences*, *18*(1), 20220713

Zhang, Y., Wang, L., & Wang, J. (2021). Applications of AI in Agriculture: A Review. *Computers and Electronics in Agriculture*.