The Increasing Use of Digital Technology in Agriculture

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ABSTRACT

The increasing use of digital technology is transforming modern agriculture by enhancing productivity, efficiency, and sustainability. Innovations such as precision farming, remote sensing, Internet of Things (IoT), artificial intelligence, mobile applications, and data analytics enable farmers to make timely and informed decisions related to crop management, soil health, irrigation, pest control, and marketing. Digital platforms also improve access to weather information, extension services, and markets, thereby reducing risks and production costs. (Naika *et al*., 2021) Despite challenges related to digital literacy, infrastructure, and affordability, the adoption of digital technologies holds significant potential for improving farmers' livelihoods, strengthening food security, and promoting climate-resilient and sustainable agricultural systems.

INTRODUCTION

Agriculture, one of the oldest and most essential human industries, is undergoing a major transformation driven by digital technology. With the global population growing and food demand increasing, farmers must produce more using fewer resources. Digital technologies such as artificial intelligence (AI), drones, remote sensing, data analytics, GPS systems, and smart irrigation are helping them do exactly the same (Patel *et al*., 2025). This integration of technology into farming is known as digital

agriculture or smart farming, and it is reshaping how food is grown, managed, and delivered.

The Role of Digital Technology in Modern Agriculture

1. Precision Farming:

Precision farming uses GPS, sensors, and data analytics to optimize crop production (Yadav & Sidana, 2023). Farmers no longer treat entire fields the same; instead, they can address the specific needs of each crop zone.

- Soil sensors measure moisture, nutrients, and temperature.
- GPS-guided machinery helps plant seeds and apply fertilizers with high accuracy.
- Yield mapping allows farmers to evaluate crop performance and adjust future strategies.

This reduces waste, increases yield, and saves time and labour.

2. Drones and Remote Sensing

Drones equipped with cameras and sensors provide real-time information about crop health. (Abbas *et al*., 2023).

- They identify pests, diseases, and water stress quickly.
- Aerial mapping helps farmers make informed decisions without physically inspecting every part of the field.
- Thermal sensors detect irrigation issues and nutrient deficiencies.

Drones significantly reduce the cost and time required for field monitoring.

Figure 1. Use of Drones and Remote Sensing in Agriculture

3. Smart Irrigation Systems

Water scarcity is a growing concern in agriculture. Smart irrigation systems use sensors and weather data to deliver water only when needed.

- Automated sprinklers turn on and off based on soil moisture.
- Drip irrigation systems optimize water usage for each plant.
- Remote controls allow farmers to manage irrigation from smartphones.

These systems can reduce water usage by up to 50%.

4. Artificial Intelligence and Machine Learning

AI analyses large amounts of agricultural data to provide practical insights.

- AI-powered apps help diagnose plant diseases by analysing pictures.
- Machine learning models predict crop yields and weather patterns.
- Robotics automate tasks like harvesting and weeding.

AI supports faster and more accurate decision-making for farmers.

5. Internet of Things (IoT) in Farming

IoT devices connect farm equipment, sensors, and tools to a central platform.

- Smart tractors collect field data while working.
- Livestock trackers monitor animal health and movements.
- Weather stations provide accurate microclimate data.

IoT helps farmers manage their entire operation from a single dashboard.

6. Blockchain and Supply Chain Management

Blockchain technology improves transparency and traceability in the agricultural supply chain.

- Consumers can trace food from farm to table.
- Farmers get better access to markets and fair pricing.
- It reduces fraud and ensures quality control.

These builds trust between producers and consumers.

Benefits of Digital Technology in Agriculture

- Higher crop yields due to data-driven farming.
- Reduced labour costs through automation.
- Improved resource efficiency, especially water and fertilizers.
- Better crop health monitoring and early detection of problems.
- Climate-smart farming through accurate weather forecasting.
- Enhanced food quality and safety through traceability.

Challenges in Adopting Digital Agriculture

While the benefits are significant, some challenges remain:

- High cost of digital tools.
- Limited internet access in rural areas.
- Lack of technical knowledge among farmers.
- Data privacy concerns.
- Resistance to technological change.

Governments and organizations must work together to provide training, infrastructure, and financial support.

CONCLUSION

The increasing use of digital technology in agriculture is revolutionizing the way food is produced. By adopting precision farming, AI, IoT, drones, and smart irrigation systems, farmers can increase productivity while using fewer resources. These technologies create a more sustainable, efficient, and profitable agricultural sector. As digital tools become more accessible, the future of farming will be smarter, greener, and more resilient—helping to feed the world for generations to come.

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