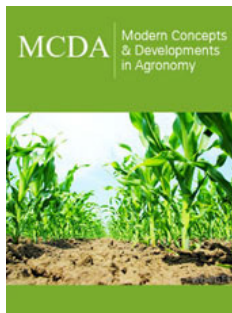


# IoT Advancements in Agronomy: A Mini Review

**Ali Imam Sunny\***


Senior Scientist and Lecturer, UK

ISSN: 2637-7659



**\*Corresponding author:** Ali Imam Sunny, Senior Scientist and Lecturer, Ernst & Young, 1 More London Pl, London SE1 2AF, UK

**Submission:**  January 19, 2023

**Published:**  March 14, 2023

Volume 12 - Issue 4

**How to cite this article:** Ali Imam Sunny\*. IoT Advancements in Agronomy: A Mini Review. Mod Concep Dev Agrono. 12(4). MCDA. 000792. 2023.  
DOI: [10.31031/MCDA.2023.12.000792](https://doi.org/10.31031/MCDA.2023.12.000792)

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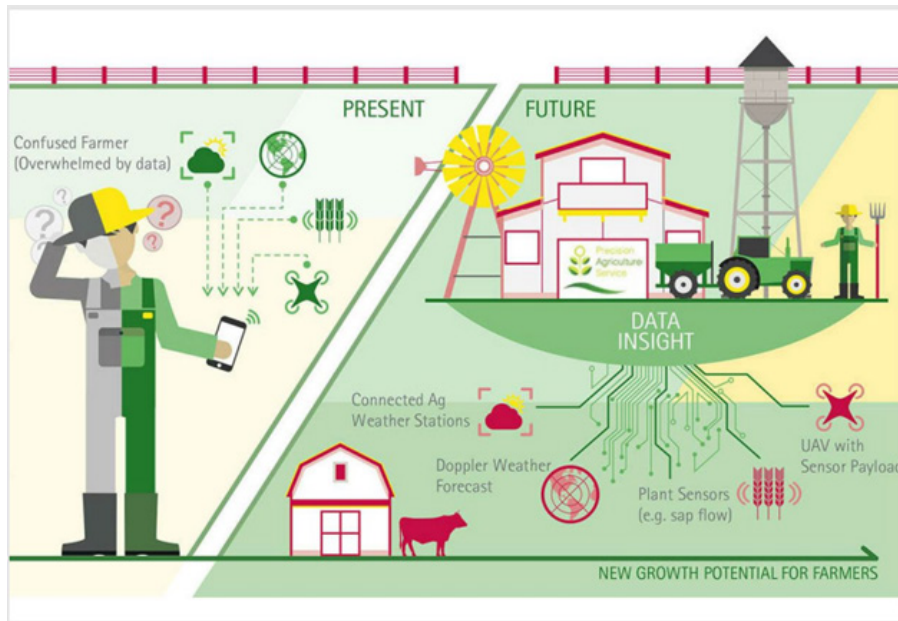
## Introduction

Agriculture has always been a vital aspect of everyone's life. Agriculture is responsible for everything we eat and wear, whether directly or indirectly. However, in most parts of the world, farming is still done in a traditional manner, resulting in poorer agricultural output. To break down the old system, we need to discover a new solution that enhances productivity, quality, and is also cost-effective, which can only be accomplished with the aid of technology. Because of technological advancements, the agriculture industry has increased significantly in the last several years. Farmers, for example, may now monitor soil humidity, crop health, and many other variables using various sensors thanks to the Internet of Things (IoT). As a result of eliminating human interaction through automation, Internet of Things (IoT) technology may make agriculture more efficient, productive, and cost-effective. The Internet of Things is a gateway to the solution of smart farming, which will undoubtedly alleviate problems such as food starvation. The deployment of IoT in the smart farming and agriculture business, as well as its numerous applications in the realm of technical breakthroughs, have been thoroughly explored in this paper.

## Technical advancements in Agronomy

Agronomy is the science and technology of producing and using plants for food, fuel, and other products. The field of agronomy has undergone significant technological advancements in recent years, which have greatly improved crop yields and overall efficiency in agriculture. One of the major technological advancements in agronomy has been the development of precision agriculture. Precision agriculture involves using advanced technologies, such as GPS, remote sensing, and precision planting equipment, to optimize crop production [1]. These technologies allow farmers to precisely map and monitor their fields, which enables them to make more informed decisions about planting, fertilizing, and harvesting their crops. As a result, precision agriculture has greatly increased the efficiency and productivity of modern farms. Another technological advancement in agronomy has been the use of biotechnology in crop production. Biotechnology is the application of scientific and engineering principles to the study of living organisms and has led to the development of genetically modified crops [2]. These crops have been modified to improve their resistance to pests, disease, and environmental stress, which has greatly increased crop yields and reduced the need for pesticides and other chemicals.

The use of data analytics and artificial intelligence in agronomy is another major technological advancement. These technologies allow farmers to collect and analyze large amounts of data on their crops, such as weather, soil conditions, and crop health. This enables farmers to make more informed decisions about planting, fertilizing, and harvesting their crops, which can lead to increased crop yields and efficiency [3]. Also, the use of drones and robots in agronomy is another technological advancement that is becoming increasingly popular. These technologies enable farmers to monitor their crops, detect pests, and spray pesticides more efficiently. They also enable farmers to collect data on crop health, crop growth, and soil conditions [4-6]; (Figure 1).



**Figure 1:** Centrality of data insight for future farming and agriculture solutions [6].

## IoT Requirements: Connectivity, Robustness and Legacy Technologies

In the field of agronomy, IoT technology has been used to develop a wide range of smart devices and sensors that can monitor and control different aspects of crop production. The development of these new agricultural technologies and techniques is heavily reliant on the development of linked items [5]. However, the domain has particular connection requirements. A fundamental necessity is, of course, the capacity of communication networks to efficiently deploy and cover rural regions. The primary connection needs of agricultural IoT applications are broad coverage and cheap implementation or maintenance costs. Most monitoring and data collecting applications, on the other hand, have very modest bandwidth and latency requirements [6]. As a result, legacy 2G networks and LPWA technologies (LoRa, Sigfox) are particularly well suited for most current deployments. However, the long-term viability of these networks cannot be assured, and given the lifespan of agricultural equipment, this uncertainty may cause manufacturers to postpone technical decisions [7].

However, more sophisticated use cases (such as video, complete automation, or augmented reality) will necessitate the ability to function with intermittent connectivity or the deployment of new generations of networks (5G). Furthermore, in order to be deployed successfully in rural locations, IoT systems must be able to endure environmental specificities (limited access to power, dust, rain, vibration, etc.). These variables, if not taken into consideration, can dramatically hinder technology adoption.

## Conclusion

In conclusion, technological advancements in agronomy have greatly improved crop yields and overall efficiency in agriculture.

Precision agriculture, biotechnology, data analytics and artificial intelligence, drones and robots have all made significant contributions to this field and have the potential to revolutionize the way we grow crops in the future. Furthermore, IoT technology has made a significant impact in agronomy. IoT-enabled devices and sensors can collect and analyze data on crop conditions and weather, which can help farmers make better decisions about crop management. Additionally, IoT technology can improve efficiency and reduce labor costs by enabling farmers to remotely monitor and control irrigation systems and use drones and robots for crop monitoring and management. With the rapid advancement in IoT technology, the future of agronomy looks promising.

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