International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 22 No. 3 (2026)

ijerst.editor@gmail.com

editor@ijerst.com

ISSN 2319-5991 www.ijerst.com

Peer Reviewed, Referred & Indexed Journal

Research Paper

INTERNET OF THINGS IN AGRICULTURE: A REVIEW

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Abstract

Internet of Things refers to the use of smart devices, such as sensors and cameras, in agriculture to collect data on crops, soil, and weather. Farmers can use this information to make more informed decisions about fertilization, watering, and plant protection. Farmers can watch their fields remotely and intervene swiftly when necessary by connecting everything to the internet, which results in healthier crops and higher yields. This study examines how the Internet of Things has created new smart agricultural devices. IoT applications in agriculture, such as precision farming, livestock monitoring, alerts and notifications, crop health monitoring, and sprinklers, are explained first, along with the devices used for smart farming. Next, what IoT gadget is utilized in farming? Thus, this article will discuss IoT applications in agriculture.

Keywords: application, sensors, drones, agriculture, and the Internet of Things (IoT).

I. Introduction

The networks of physical objects, or "things," integrated with sensors, software, and other technologies that allow them to communicate and exchange data with other devices and systems over the internet are referred to as the Internet of Things (IoT). These products might be anything from commonplace items like wearable technology and home appliances to industrial machinery and infrastructural parts. By facilitating communication and data sharing between physical objects and the digital world, IoT aims to automate operations, increase efficiency, improve decision-making, and develop new services or experiences.

The interaction of objects integrated with communication devices is the focus of the Internet of Things, a contemporary technology. By measuring soil moisture and, in the case of vineyards, tracking trunk diameter, the Internet of Things has the potential to improve and fortify the agricultural sector.

The internet of things (IoT) is transforming conventional agricultural methods in agriculture by integrating technology to increase sustainability, productivity, and efficiency. IoT devices are being developed on farms to gather real-time data on a variety of parameters, including soil conditions, weather patterns, crop growth, and machine performance. These devices include soil moisture sensors, weather monitors, crop monitors, and drones.

The Internet of Things (IoT) is a global network of things, which consists of both physical and virtual items with unique identities that may be connected via a large network to exchange information and transform it into useful data.

Farmers may connect to their farm at any time and from any location thanks to IoT.

By increasing productivity, quality, and sustainability, adhering to regulations, and meeting customer demand for transparent and ecologically friendly food production methods, IoT use in agriculture can boost farms' competitiveness.

IoT technology makes it easier for farmers to gather data on weather, moisture,

temperature, and other agricultural variables at any time. Additionally, wireless cameras have been utilized to observe the form's state from a distance.

II. Applications Of Iot In Agriculture

Smart farming is now possible thanks to the Internet of Things. Internet of Things (IoT) applications include the following:

Precision farming

GPS systems, sensors, and big data are just a few of the technology used in precision farming to maximize agricultural harvests.

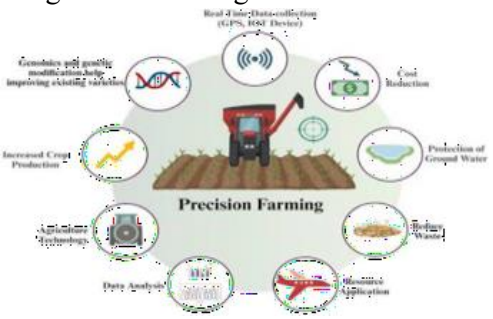

Figure 1. Proposed IoT system model for precision agriculture.

Smart Irrigation

A developing method that reduces water consumption and automates irrigation systems is the smart irrigation system. This method modifies irrigation according to the real soil and climate. Irrigation is typically required in areas with inconsistent rainfall, dry spells, or frequent dehydration episodes. . Surface, drip, and sprinkler irrigation are examples of traditional irrigation.

Crop Health Monitoring

One such technology advancement is the agricultural crop monitoring system. It makes use of the Internet of Things (IoT) and wireless sensor networks.

In order to detect early indicators of stress, illnesses, nutritional deficiencies, and other elements that may impact plant development and productivity, crop health monitoring is crucial.

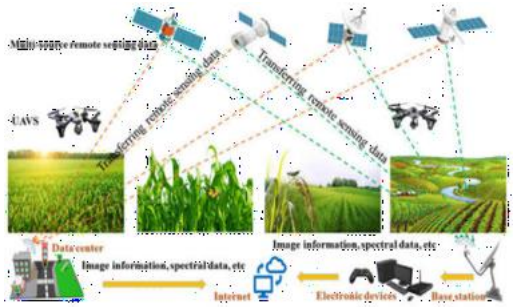

Figure 2. Integration of Remote Sensing and Machine Learning for Precision Agriculture.

A. Livestock Monitoring

The quality of life (QoL) of livestock and the state of the land where animals are raised are two crucial resources for managing livestock production lines.

The design and building of a cloud control unit is one method for attaining success in animal husbandry monitoring. The system's goal is to collect data in real time or at predetermined intervals from a variety of IoT devices.

Figure 3. Digital Livestock Farming.

B. Alerts and Notifications

Put alert systems in place to inform farmers of changes in the weather or the need for irrigation. Continue gathering soil and meteorological data in real time.

III. Iot Devices Used In Agriculture

A vast array of sensors, actuators, and networked devices designed to track, manage, and improve different facets of farming operations are included in the category of IoT devices used in agriculture.

A. Soil Moisture Sensor

The water content of the soil is processed by a soil moistness sensor. It makes use of the soil's electrical hostile materials. To find out how much water the soil needs, a soil moisture sensor is employed. It is employed to water the land automatically. This helps farmers to generally use less water to grow a crop.

B. Temperature Sensor

It is a relatively inexpensive sensor. It has a linear output with a low output impedance. A temperature sensor is an electrical device that keeps track of the ambient temperature. The impact of soil temperature Microbial activity, photosynthesis, respiration, transpiration, and soil water potential.

C. Drones

Regular physical tasks in agriculture could be revolutionized by drone technology. Farmers can create soil maps, accurately measure land sizes, categorize crop types and varieties, and apply efficient pest management techniques by utilizing a variety of sensor configurations. Drones are used for spraying, seeding seeds from the air, monitoring agricultural health, monitoring water stress, monitoring nutritional status and deficiencies, etc.

D. Electromagnetic sensors:

Agricultural soil and pollution can be found using electromagnetic sensors. A broad range of waves that are received from different objects are detected by electromagnetic sensors. This yields the real temperature value after being raised by the translation factor. Soil-water content estimation has been linked to electric magnetic induction and ground penetrating radar. Additionally, the sensors can be used to measure soil organic matter concentrations, residual nitrate levels, and transpiration rates in real time.

E. Greenhouse Monitoring System

In protected farming, greenhouse monitoring systems use IoT sensors to control temperature, humidity, light intensity, and carbon dioxide levels automatically. This creates optimal growing conditions and increases crop productivity. Additionally, AI-enabled cameras and pest detection sensors continuously monitor plant health, detect diseases and pests at an early stage, and alert farmers so that timely corrective measures can be taken.

IV. Conclusion

By utilizing technology to increase production and efficiency, lower input prices, lessen the impact on the environment, and improve the overall sustainability of agricultural operations, the internet of things (IoT) in agriculture is transforming farming. Formers will benefit from IoT integration in agriculture as well. IoT in agriculture makes it simple to monitor crops at any time and from any location.

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