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Smart Agriculture with IoT in Indian Farming

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Abstract

Agriculture farming began around 12000 years ago, with the Neolithic epoch giving birth to civilization, farming, and later being continued as traditional farming techniques. As an agrarian country, India's farming is heavily reliant on precipitation, soil, humidity, and environmental difficulties. Our farmers switched to cutting-edge agricultural technology. Globally, Internet of Things (IoT) systems have contributed to and shown to be successful in a variety of industries. It is now time for Indian farmers to implement Smart Agricultural Systems in order to increase crop productivity. Smart agriculture is a superior choice for increasing food output, managing resources, and labour. Internet of Things (IoT) devices with cloud administration, security units for multi culture in agriculture, and taking farmers' earlier experiences into account.

Introduction

In terms of farm size, technology, trade, government policy, and other factors, Indian farmers are at a significant disadvantage. ICT, or information and communication technology, can help farmers with some of their issues. We are now entering the third and perhaps most "disruptive" phase of the Internet revolution, the "Internet of Things (IoT)," also known as "Ubiquitous Computing," following the World Wide Web (of the 1990's) and the mobile Internet (of the 2000's). Agriculture, healthcare, retail, transportation, the environment, supply chain management, infrastructure monitoring, and other fields are all included in the scope of IOT applications. Monitoring systems for greenhouses, the food supply chain, monitoring of animals, and other applications in agriculture are only a few examples.

The Internet of Things (IOT) is a worldwide network of intercommunicating devices. It integrates ubiquitous communications, pervasive computing, and ambient intelligence Internet of Things will connect the world's objects in both a sensory and intelligent manner through combining technological developments in item identification ("tagging things"), sensors and wireless sensor networks ("feeling things"), embedded systems ("thinking things") and nanotechnology ("shrinking things").

Utilizing IoT technologies will enable farmers to increase output while reducing the waste production. This may result from factors such as the amount of fertilizer used or the numbers of trips the farm trucks have taken (Sahoo, 2020). So, smart farming is essentially a high-tech method of producing healthy, sustainable food for the public. It is both the introduction and the use of contemporary ICTs in agriculture.

IoT Agriculture Applications

The following are some of the applications of IoT in Agriculture as listed by Reddy (2019) and Ravindra (2020).

1. Precision Agriculture

Precision farming is a farming method or practice that improves the accuracy and control of animal and agricultural production. In this method, the employment of IT and objects such as sensors, autonomous cars, automated hardware, control systems, robots, and so on is critical. Precision agriculture has become one of the most well-known IoT applications in the agricultural industry in recent years, and a large number of companies across the world have begun to use this technology.

2. Agriculture Drones

Drones used in agriculture are a great illustration of IoT applications. The use of drones in the agriculture industry has grown significantly in recent years. Drones, both ground-based and aerial, are being used in agriculture in a variety of ways, including for soil & field study, irrigation, planting, and crop health evaluation. Drone use has several advantages, including simplicity of use, time savings, crop health imaging, integrated GIS mapping, and the capacity to boost yields.

3. Livestock Management

IoT applications help farmers to collect data regarding the location, well-being, and health of their cattle. Every livestock animal on the farm can be equipped with specific sensors for managing livestock. These sensors maintain a performance log and gather information on animal health. Using smart farming techniques, producers may better monitor the nutritional requirements of individual animals and modify their diet accordingly, reducing sickness and improving herd health.

4. Smart Greenhouses

A smart greenhouse uses embedded IoT technology to automatically monitor and manage the environment. Removing the need for human intervention in the process. These configurations use a variety of sensors to monitor and manage the microclimate to ensure the best possible plant development. Growlink, Farmapp, and Green IQ all provide this feature in their greenhouse monitoring software.

5. Crop Water Management

Ample water is required in order to carry out agricultural tasks effectively. Web Map Service (WMS) and Sensor Observation Service (SOS) are combined with agriculture IoT to provide effective water management for irrigation, which in turn decreases water waste.

6. Integrated Pest Management or Control

Using adequate live data monitoring of temperature, moisture, plant development, and insect levels, agriculture IoT systems provide farmers with reliable environmental data assurance so that necessary care may be taken throughout production (Gupta *et al.,* 2017).

Benefits of using IOT in Agriculture

The following are the benefits of IOT applications in agriculture:

• Improvement in the use efficiency of inputs (Soil, Water, Fertilizers, Pesticides, *etc*).

• Reduced cost of production.

• Continuous and real-time crop monitoring.

• Increased profitability.

• Better management of farm activities.

• Protection of the environment.

Conclusion

To fulfill the rising food demand of the growing global population in the face of the ever-dwindling arable land, the focus must be on smarter, better, and more effective crop-growing technologies. Currently, one can easily observe the development of new techniques for boosting agricultural productivity and handling: Younger, tech-savvy individuals choosing farming as a career and using agriculture to become independent from fossil fuels. In addition, a greater understanding of contemporary research initiatives is required for improved IOT in Agriculture.

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