Chapter 11
Field to Cloud:
Unveiling IoT Triumphs in Agricultural Evolution

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ABSTRACT

The integration of Internet of Things (IoT) into the agricultural sector exhibits the potential for modernising conventional farming and tackling various obstacles faced by the community. This chapter focuses on the transformative capacity of the IoT in the agricultural sector, stressing significant insights and discoveries obtained from several case studies. The IoT enables farmers to empower for efficient farming operations and risk reduction by monitoring and analysing data in real-time. Real world applications show IoT's precise agriculture solutions, which contribute to sustainable farm mechanisation, enhanced livestock management, food safety, block-chain technology, and supply chain visibility. Collaboration among stakeholders, giving priorities for research and innovation, and encouraging technology adoption are essential for progress. By adopting the IoT and incorporating research inputs, the agricultural industry can initiate an approach towards efficient and sustainable automation, thereby guaranteeing a prosperous future for farmers and communities on a global scale.

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INTRODUCTION

Background

The Internet of Things (IoT) refers to a network of interconnected devices that are capable of engaging with the Internet, facilitating the exchange of data, and enabling uninterrupted connectivity across various platforms and devices. The system consists of a range of devices, including sensors, actuators, controllers, and intelligent gadgets, which are endowed with computing capabilities and connect to the internet. These gadgets employ sensors to gather data from their surroundings and transmit it across the internet to centralized platforms for the purpose of analysis and subsequent action. Cisco defines the IoT as a network of various devices such as appliances, cars, buildings, and other objects that facilitate the collection, exchange, and connectivity of data (Gupta & Quamara, 2020).

Historical Development of IoT

IoT technology emerged in 2000 with the introduction of RFID (Radio Frequency Identification) and sensor networks (Duroc, 2022). The widespread use of wireless communication technologies like Wi-Fi, Bluetooth, and cellular networks, along with miniaturization and energy efficiency, significantly accelerated IoT's growth across various industries. It is significantly transforming the agricultural sector through its ability to facilitate precision farming, intelligent decision-making, and real-time monitoring of critical parameters such as soil moisture, temperature, crop health, and animal behavior (Lambrinos, 2019). This data improves agronomic techniques such as tillage, irrigation, fertilization, and pest control, hence increasing productivity, optimization of resources, and promotion of sustainability. In recent years, the integration of IoT with automatic all-terrain vehicles has significantly advanced precision farming practices, providing new avenues for enhancing agricultural efficiency and productivity (Padhiary, Kumar, et al., 2024). The integration of multiple agricultural systems, facilitation of smooth data interchange, assurance of traceability and transparency, and adherence to legal requirements are all dependent on the utilization of IoT technology.

Aim and Scope of Study

This chapter examines the profound influence of the IoT on the agricultural sector, with a specific emphasis on the effective integration of this technology in various industries. This elucidates how IoT technologies augment productivity, sustainability, and profitability. The utilization of IoT technology in precision agriculture,

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