Chapter 6
Applications of Sensors in Precision Agriculture for a Sustainable Future

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ABSTRACT

The advent of precision agriculture has revolutionized the agricultural sector, emphasizing the utilization of data-driven strategies for decision-making and the optimization of resources. Sensors, encompassing soil, crop, weather, and drone sensors, offer real-time data to facilitate informed decision-making and enhance agricultural outcomes. These sensors facilitate the optimization of irrigation and fertilization and the timely identification of soil-related problems. In addition, they contribute to the surveillance of plant health, the detection of weed infestations, and the monitoring of meteorological conditions. The gathering and management of data play a crucial role in precision agriculture. The advantages encompass decreased utilization of resources, heightened agricultural productivity, a diminished ecological footprint, and better economic viability. Nevertheless, persistent obstacles like technological problems, concerns around data security, and the imperative for advancements in artificial intelligence and machine learning persist.

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1. INTRODUCTION

1.1 What is Precision Agriculture

Precision agriculture, or precision farming, is a contemporary method that utilizes technology to enhance many components of the agricultural process. This approach entails the utilization of cutting-edge technologies such as GPS guidance systems, sensors, drones, and data analytics to gather and scrutinize data about the variability of crops in the field. Farmers can make well-informed determinations using precision agricultural methodologies regarding the allocation of resources such as water, fertilizers, and pesticides. The utilization of a focused and data-oriented strategy enables the adaptation of agricultural methods according to precise conditions within a given area, resulting in enhanced productivity, and minimized ecological consequences.

Precision agriculture boosts farm output. Farmers can control inputs more precisely, improving yields and saving money. Farmers may maximize resource allocation, reduce waste, and improve sustainability by adapting their actions to each field area. Precision agriculture also allows real-time crop health monitoring for diseases, pests, and nutritional deficits. This proactive method helps farmers to take prompt corrective steps, avoiding crop losses and increasing agricultural resilience to changing environmental conditions as shown in Figure 1.

Figure 1. Precision Agriculture
(Thilakarathna and Raizada's, 2018).