

Chapter 67

Emerging Technological Model to Sustainable Agriculture

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ABSTRACT

The agricultural sector has witnessed significant technological transformations over the last few decades. The state-of-the-art technologies are transforming the traditional agriculture models into digital agriculture. From these technologies, conventional agriculture has evolved and shifted towards a smart agriculture system. In a smart agriculture system, farmers can collect and analyze the collected data to fertilize and tend their crops. The smart agriculture system provides economical and more accurate ways to predict and protect crop growth. The incorporation of these technologies digitalizes the agricultural industry by increasing profits, reducing waste, improving efficiency, and becoming sustainable. This chapter aims to study the state-of-the-art technologies used in the agriculture sector and proposes a smart agriculture model using these technologies.

1. INTRODUCTION

Agriculture is the oldest industry in civilization in the world. Recently, it is disrupted by digitization and modern technologies. With current technologies, farmers can increase the chances of facing diseases, unpredictable weather, and pandemics. Growing and providing food for an increasing global population is a new challenge today. This issue needs to increase food supply to the growing community and

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ensure food security. With the rising population worldwide, food production and farming need to get increasingly productive and capable of high yields in a limited time. To meet these demands, farmers and agricultural organizations have to push their current practices' innovation limits.

There is a need for a resource with an efficient food production system that takes into consideration the aspect of *sustainability*. For example, efficient water use reduces soil erosion, ensures minimum degradation, and minimizes energy input. According to Melanie McMullen, 2017 the most significant challenges in today agriculture include

- Farmers have inadequate training and the use of modern technologies.
- Most agricultural companies are small, with fewer employees.
- The fields are located far away from farmers' homes.
- Global warming makes temperature, weather, and climate conditions less predictable.
- The growers have fewer budgets to carry out the technologies on their annual profit.
- The pests can ruin an entire crop.

A low level of digital knowledge and skills can create a significant gap benefitting from the modern agriculture revolution in the existing infrastructure. These conditions allow introducing different models in incorporating digital technologies into agriculture. Every farmer hopes to achieve all his or her goals at the minimum cost and period. However, such purposes post some of the requirements, which cannot be fulfilled through traditional agricultural methods.

Motivation

For example, in the agriculture system, sowing seeds is a laborious manual task. This task often uses a scattered method by a human. This method can be inaccurate and wasteful when seeds fall outside the optimal locality. Hence, it requires an effective seeding method of planting seeds to allow optimal plant growth.

Modern agriculture replaces the scatter method with seeding machines, covering more space faster than a human can. Precision seeding equipment is designed with various factors (i.e., combine Geomapping, sensor data, soil quality, density, moisture, and nutrient levels) that takes a ton of the cultivating cycle's mystery. Seeds get the opportunity to grow and develop, and the general yield may have a superior reap.

As traditional cultivating moves into the future, existing exactness seeders may accompany self-ruling work vehicles and innovation empowered frameworks. A whole field might be planted with single human observing the cycle over a computerized control while numerous machines move over the region.

Innovation in Agriculture

With the expansion in food requests and the requirement for supportability in agribusiness, the ranchers and the partners need to put a ton in information and more mechanized farming machines and gadgets. In the modern world, "*how to increase the quantity and quality of agricultural products*" meets the increasing populations worldwide with less cost and time. The answer is using state-of-the-art technologies in agriculture or smart agriculture. The emerging technologies can identify the technologies expected to affect the agriculture sector significantly. The purpose is to examine state-of-the-art technologies in agriculture and assess them against selection criteria. The other research questions are:

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