Chapter 2
The Rise of Smart Farming:
AI's Role in Modern Agriculture

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ABSTRACT

AI is becoming more widely acknowledged as a potent instrument for transforming farming methods. A more sustainable & effective food production system is required due to the growing global population, & AI has various benefits in this area. The transformational potential of AI in agriculture is the main topic of this chapter, which also emphasizes how it may improve resource management, address food security, & raise overall agricultural output. A more sustainable & effective agricultural sector is facilitated by AI-powered systems that provide accurate solutions for crop monitoring, disease identification, resource optimization, & increased yield—all of

DOI: 10.4018/979-8-3373-4827-8.ch002

which are crucial given the world's expanding population. Although AI has enormous potential for the agriculture industry, there are many challenges (e.g., need for additional data, creation of accessible & reasonably priced AI solutions), & requirement for farmer education/training. Enhancing AI algorithms, creating fresh uses for AI in agriculture & resolving adoption barriers will be the main goals of future research/development.

1. INTRODUCTION

In the realm of computer science, one key area of study is without a doubt A1. AI is gaining a good deal of popularity because AI problems applicability and potential technological advancements, mainly in regards to challenges that humans or even classical computing paradigms are unable to address (Rich et al., 2009).

According to the United Nations Food & Agriculture Organization a substantial change is required in agriculture due to the massive growth of population by 2050. To solve this unprecedented food scarcity due to climate change and other environmental and human issues, AI will a play a pivotal role. Agricultural production has taken a new turn due to the advancement of AI (Liu, 2020; Rich et al., 2009).

The problem of food shortages and rapid population increase together provide one of the biggest obstacles to global sustainable development. Agricultural systems are under tremendous strain as the world's population grows, particularly in developing nations with scarce resources. These increasing demands are frequently too much for traditional farming practices to handle effectively or sustainably. As a result, new digital technologies like mobile internet, the IoT, and AI are promising ways to change agriculture through smart farming (SF) techniques. In order to make more accurate and well-informed decisions that increase output and decrease resource waste, farmers are using these advancements to gather, transmit, store, and analyze agricultural data in real time. The IoT, which links a variety of sensors to track operational and environmental factors like soil moisture, water levels, irrigation effectiveness, and climate, is at the core of many smart farming systems. The automation of systems like smart irrigation, which combines sensors, controls, and predictive algorithms to guaran-