Chapter 3
Application of Artificial Intelligence (AI) in the Agriculture Sector

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ABSTRACT

Several studies have shown that Artificial Intelligence (AI) algorithms can accurately predict crop yields based on data from various sources, such as weather conditions, soil moisture levels, and crop growth rates. Integration of AI in agriculture has the potential to revolutionize the way we grow and produce food. By collecting and analysing data, optimizing resource utilization, and increasing sustainability, AI can help farmers improve crop yields and reduce waste, leading to a more efficient and sustainable agricultural sector. However, there are also concerns about the impact of AI on employment and the potential for unintended consequences, so it will be important to proceed with caution and continue to monitor the effects of AI on agriculture. The use of (AI) in agriculture has been the subject of numerous studies and research papers in recent years. In this chapter, authors examine some of the key findings and insights from the agriculture sector. Major contributions by a number of start-ups have been considered for explanation purpose.

1. INTRODUCTION

The primary industry for employment is agriculture in several nations throughout the world. With passage of time, technology has transformed farming, and this has had a wide range of implications on the agriculture sector. Only an additional 4% of the planet's surface will be cultivated by 2050, when population is projected to rise from 7.5 billion to 9.7 billion, adding to the pressure on the land. Farmers will therefore need to work more while utilizing fewer resources. According to estimates, a 60% increase in food production would be required to feed an additional two billion people. Agriculture, an essential consideration of any country, is still one of the major challenges currently. It is approximated that over 820 million people are in hunger today (Abbas et al., 2020).

Traditional methods fall short of fulfilling this colossal requirement. Artificial Intelligence (AI) is consequently increasingly contributing to the technical development of the agriculture industry. By the year 2050, the goal is to increase the world's food production by 50% in order to feed an additional two billion people. Farmers will be able to work more productively while also improving crop quality and quantity and assuring a speedier time to market with the aid of AI-powered technologies (Ananthi et al., 2017). For human existence, agriculture is essential. Significant fraction of the global population relies on agriculture for livelihood.

Also, it provides citizens with a wide range of employment options. Low yields are a result of conventional farming methods, which are still preferred by farmers. The long-term expansion and development of the economy depend heavily on agriculture and allied businesses. The decision-making process, crop selection, and supporting systems for enhancing crop yield are the main problems in agricultural production. Natural factors including temperature, soil fertility, water volume, water quality, season, and crop prices have an impact on agriculture forecasts. An overabundance of tools and apps for quick knowledge acquisition have emerged as a result of growing developments in agricultural automation. For efficient irrigation and crop management, it is necessary to maintain real-time monitoring and precise predictive models due to the changing dynamics, non-linearity of soil moisture content, and other weather and plant variables (Khang & Agriculture et al., 2023).

One of the primary aids of using AI in agriculture is the ability to collect and analyze large amounts of data. Sensors and other monitoring devices can be deployed throughout fields to gather information on soil moisture, nutrient levels, weather conditions, and other important factors. This data can then be fed into AI algorithms, which can identify patterns and make predictions about future crop performance. AI can also be used to optimize the use of resources such as water and fertilizer. By analyzing data on soil moisture levels, for example, AI algorithms can decide the time and amount of water to apply to crops to maximize yields while minimizing waste. Similarly, AI can help farmers optimize the use of fertilizer by analyzing soil nutrient levels and predicting crop needs. In addition to improving crop yields, AI can also help farmers reduce waste and increase sustainability. For example, AI algorithms can help identify pests and diseases early on, permitting farmers to take preventive measures before significant damage is done. This can reduce the need for pesticides and other chemicals, leading to a more sustainable approach to farming.

For example, a study conducted in China found that an AI-based model was able to predict maize yields with an accuracy rate of over 90% AI has also been used to optimize the use of resources such as water and fertilizer. A study published in the journal Nature in 2018 demonstrated how an AI algorithm could be used to optimize irrigation in wheat fields, resulting in a 50% reduction in water usage without any reduction in yield. Similarly, a study conducted in India found that an AI-based model could optimize

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