


Chapter 5

Artificial Intelligence (AI)– Driven IoT (AIoT)–Based Agriculture Automation

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ABSTRACT

The fusion of IoT and AI encompasses given rise to a new concept - artificial intelligence driven IoT (AIoT). AIoT is the intersection of AI and IoT, where AI algorithms are used to assess the data collected by IoT devices, improving their effectiveness and intelligence. AIoT-based agriculture has become the outcome of the new opportunities for agricultural automation that this technology has made possible. Agriculture automation powered by AI and IoT is revolutionising the sector. It could lead to higher output, lower expenses, and better sustainability. The need for food will only grow as by 2050, it is expected that there will be 9.7 billion people on the planet. In addition to meeting this demand, AIoT-based agricultural automation can help with resource scarcity and climate change issues.

INTRODUCTION

Global population growth is expected to accelerate, with estimates of 10 billion people within 2050. This places a great deal of pressure on the agriculture industry to raise yield per hectare and improve crop productivity. Agriculture is becoming less profitable due to a number of issues that farmers face, including small land holdings, a labor shortage, climate change, extreme weather, and a decline in soil fertility. Climate change along with persistent danger to agriculture has come from other environmental problems in recent years, making it extremely difficult to achieve increased productivity by Subeesh(2021).

Agriculture automation is the practice of using technology and machinery to improve and streamline processes in the agricultural industry. It involves the integration of various technologies such as sensors, robotics, and AI to perform tasks that were previously done manually by farmers. This trend has been gaining traction in recent years, and it is transforming the way we produce, process, and distribute food by Priya(2023)& Wale(2019).

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The need for agriculture automation has become increasingly evident as the need for food increases along with the growth of the global population. United Nations projects that by 2050, there will be 9.7 billion people on the planet, meaning that farmers must produce 70% more food compared to what they do now in order to meet demand. This is a daunting task, especially when considering the challenges that farmers face, such as climate change, labor shortages, and limited resources.

One of the main benefits of agriculture automation is increased efficiency and productivity. With the use of advanced technologies, farmers can now perform tasks such as planting, watering, and harvesting crops at a much faster rate and with greater accuracy. This not only saves time and labor but also reduces the risk of human error, leading to higher yields and better quality produce. Automation also allows farmers to monitor and manage their crops in real-time, making it easier to detect and address any issues that may arise by Sultan Kazi(2023).

Another advantage of agriculture automation is cost savings. Automation technology may require a large initial investment, but over time, it can save farmers a substantial sum of money. With the use of autonomous vehicles and drones, farmers can reduce their reliance on manual labor, which can be costly and hard to find in some regions. Automation also reduces the need for fuel, water, and pesticides, which can result in substantial cost savings for farmers. Additionally, automation can help reduce waste by precisely applying resources only where needed, further cutting down on costs by Vahida (2023) & Karale (2023).

The use of automation in agriculture also has environmental benefits. By using sensors and data analysis, farmers can gather information about their crops' health and growth, allowing them to use resources such as water and fertilizers more efficiently. This can help reduce the environmental impact of agriculture, such as water pollution and soil degradation. Automation can also aid in the transition to more sustainable farming practices, such as precision farming, which involves using data to tailor farming techniques to specific areas and crops by Gouse (2018), & Madhupriya(2022) .

Moreover, agriculture automation can help address labor shortages in the industry by Kutubuddin K(2023). As the average age of farmers increases, there is a growing concern about who will take over the responsibility of feeding the world. Automation can attract young people to the industry by offering a more technologically advanced and less physically demanding work environment. It can also allow farmers to focus on more complex tasks, such as data analysis and decision making, rather than spending long hours doing manual labor by Vinay (2022).

However, there are some challenges to implementing agriculture automation. Small-scale farmers may find it challenging to compete with bigger, technologically advanced farms due to the upfront costs associated with technology and equipment purchases. There is also a concern about the potential job loss that may result from automation by Kazi Kutubuddin (2022). However, many experts argue that automation can create new job opportunities in areas such as data analysis and maintenance of equipment by by Kazi Sul (2023a, b).

In all, agriculture automation is transforming the way we produce food and has the potential to address many of the challenges faced by the agricultural industry. By increasing efficiency, reducing costs, and promoting sustainable practices, it can assist farmers in reducing their environmental impact while satisfying the world's expanding food demand. As technology develops, we should anticipate more agricultural innovations that will influence how food is produced in the future by Priya (2023).

The farming sector has come to understand the value of precision farming over the years. By precisely measuring inputs and minimizing the overuse of potentially harmful pesticides and other inputs, precision agriculture has an environmentally friendly option which can boost productivity. Digital technology-driven

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