Smart Greenhouses-Automated Climate Control in Farming

*Aman Tiwari and Haobijam James Watt
School of Agriculture, Lovely Professional University, Phagwara, Punjab, India
*Corresponding Author's email: amantiwari82360@gmail.com

Smart greenhouses are a new way of farming that uses technology to automatically control things like temperature, humidity, light, and soil moisture. These greenhouses have sensors, Internet of Things (IoT) devices, and artificial intelligence (AI) that keep an eye on real-time data and change the inside environment to meet the plants' needs. For instance, they can automatically open vents, turn on fans, or start watering when needed. This automation makes things easier for people, saves water and energy, and makes crops grow better and more. Smart greenhouses let you grow plants all year long and keep them safe from bad weather. They are very important for meeting future food needs and encouraging environmentally friendly farming practices because they make farming more efficient and long-lasting.

Introduction

In recent years, agriculture has undergone a significant transformation as a result of the incorporation of modern technologies. One of the most innovative advancements in this field is the evolution of greenhouses that are equipped with intelligent technology. Traditional greenhouses are characterised by their reliance on manual monitoring and control of environmental factors such as temperature, humidity, and light, which frequently results in the growth of crops that are not uniformly distributed. Smart greenhouses, on the other hand, are equipped with cutting-edge technologies such as sensors, Internet of Things (IoT) devices, artificial intelligence (AI), and automation systems, the purpose of which is to provide plants with an environment that is completely under their control. These systems are constantly gathering data in real time and automatically adjusting conditions such as lighting, irrigation, and ventilation in order to cater to the specific requirements of the crops to ensure optimal growth. This not only brings about an increase in productivity and the quality of the crop, but it also reduces the amount of water, energy, and fertilisers that are used. As a result of the fact that they provide a sustainable solution to problems such as climate change, unpredictable weather, and limited agricultural land, smart greenhouses are an important innovation for the future of modern farming.

Main body

There has been a remarkable advancement in modern agriculture with the introduction of smart greenhouses. These greenhouses combine automation, data analytics, and advanced sensor technologies to produce a growing environment that is capable of self-regulating. The operation of these greenhouses is accomplished by means of a network of interconnected sensors that perform continuous monitoring of important environmental factors. These factors include temperature, humidity, soil moisture, percentage of carbon dioxide, and light intensity. The data that is collected is analysed in real time and then utilised to make automatic adjustments to the conditions through the use of devices such as fans, heaters, cooling systems, irrigation pumps, and LED lights. Because of this, plants are guaranteed to receive the optimal environment for healthy and uniform growth at all times, regardless of the climate that is present outside.

Connecting all of the monitoring and control devices into a single digital system is one of the most important roles that the Internet of Things (IoT) plays in the operation of smart greenhouses. Farmers have the ability to remotely access this system through the use of mobile applications or computers, which enables them to monitor and control their greenhouse at any time and from any location. By analysing historical data and making predictions about future environmental requirements, such as when to water the plants, how much light is required, or when to ventilate the greenhouse, Artificial Intelligence (AI) and machine learning algorithms further improve efficiency.

This high level of automation significantly reduces the amount of manual labour that is required throughout the plant growth process, while simultaneously improving accuracy and consistency. Additionally, smart greenhouses promote resource efficiency by reducing the amount of water that is wasted through drip irrigation and by optimising the amount of energy that is used through technology that controls lighting. In addition, they assist in the protection of crops against pests, diseases, and harsh weather conditions, which makes them an excellent choice for cultivation throughout the entire year.

Farmers are able to achieve higher yields and produce of higher quality with the assistance of smart greenhouses, which can lead to an increase in their income and a reduction in the risks associated with production. The excessive use of water, pesticides, and fertilisers is reduced as a result of their efforts, which contributes to the environmental sustainability of the system. The use of intelligent greenhouses provides a practical solution to the problem of maintaining agricultural productivity and food security in regions that have a limited amount of arable land or climates that are unpredictable. It is generally agreed that the incorporation of Internet of Things (IoT), artificial intelligence (AI), and automation into smart greenhouses is revolutionising farming by making it more effective, sustainable, and resistant to the challenges that modern agriculture presents.

Conclusion

Towards a future in which agriculture is both sustainable and efficient, smart greenhouses represent a significant step forward. Through the utilisation of cutting-edge technologies like sensors, the internet of things, and artificial intelligence, these systems generate a controlled environment that guarantees the best possible growth conditions for crops throughout the entire year. Not only do they help farmers save time, water, and energy, but they also improve crop yield and quality while reducing their reliance on weather that is difficult to predict. Because they enable continuous production with minimal impact on the environment, smart greenhouses are especially useful in regions that are experiencing climate challenges or have a limited amount of arable land compared to other regions. In general, the implementation of smart greenhouses represents a significant shift away from conventional farming and towards farming that is driven by technology. This shift paves the way for an agricultural future that is more productive, more environmentally friendly, and more resilient.

References

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