

# Chapter 3

## Applications of Deep Learning and Machine Learning in Smart Agriculture: A Survey


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### **ABSTRACT**

*Machine learning (ML) and deep learning can be used in the smartest way possible to improve productivity in agriculture. The Food and Agriculture Organization's research shows that the crop's production is rising. One of the finest methods to monitor agricultural yield is through smart agriculture. Applications of ML and deep learning help to discover and resolve problems that crop growth encounters. In agriculture, the production of crops can be enhanced by applying machine learning and deep learning methodologies. These methods demonstrate the rapid advancement of artificial intelligence in the agriculture sector. The idea of "smart farming" keeps an eye on all processes, disease prediction, and agricultural pests. ML is used to extract meaningful information from huge datasets. Deep learning evaluates structural characteristics, meteorological data, and climatic factors to help anticipate agricultural diseases using practical and economical techniques. The deep-learning techniques enhance agricultural research's capacity to sense the overall classification of agriculture.*

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## **INTRODUCTION**

Crop cultivation and raising livestock are two essential components of farming or agriculture. A nation's economy benefits immensely from it. A vast variety of food products and raw materials are produced by agriculture. A vast range of daily necessities are produced from raw materials utilized by industries like cotton and jute. Food and the raw materials required to generate commercial items are both produced in part by agriculture. In agriculture, standard techniques were used to cultivate crops. The majority of people worldwide use traditional or conventional farming. These procedures are time-consuming and labour-intensive because they are imprecise. Robotics, electronics, sensor, and automation technologies are all included in the field of precision agriculture as a means of using technology. Reduced workloads, increased profitability, and improved decision-making are the objectives of this technology. An agricultural management system that provides a thorough approach to regulating crop and soil variability across both spatial and temporal in order to maximize profitability, increase production, and improve the quality of products. Precision agriculture is a useful method for improving production. In comparison to low-value enterprise farms, high-value enterprise farms had a greater adoption rate for precision agriculture (Paustian, M., & Theuvsen, L., 2017). The country and geographical regions have an impact on the adoption rate of precision agriculture. Precision agriculture adoption among farmers in the hills zone is lower than those in the valley (Groher, Tanja, et al, 2020). Because such substantial expenditures are required, adoption rates might differ. Thus, finding a technique to lower the cost of the devices is necessary to enable precision agriculture on all types of fields. Modern technologies that enable precision agriculture include the Internet of Things, data mining, AI, and data science. The Internet of Things is a system of networked computing devices, such as sensors and smart devices, that can exchange data and interconnect with each other (Abdmeziem, M. R. et al, 2016). In order to anticipate crop health, agronomic apps employ wireless sensor networks to remotely monitor environmental and soil factors. To predict the timing of irrigation applications in agricultural areas, wireless networks of sensors may be utilized. Wireless sensor networks gather data regarding pressure, humidity, temperature, soil moisture, salinity, and conductivity, among other external factors. Machine learning has made agricultural applications easy to use and effective. Machine learning includes three stages: data gathering, model construction, and generalization (Akhter, R., & Sofi, S. A., 2022). In a large number of cases where human expertise is insufficient, machine learning algorithms are utilized to handle complicated issues. The prediction of soil properties like organic carbon and moisture level, crop production, diseases and weed detection in crops, and crop types recognition, may all be performed in agriculture using machine learning. Depending on the network architecture used,

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