

# Advanced Agricultural Monitoring for Weed and Crop Disease Detection: A Machine Learning Approach

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**Abstract:** *The current landscape of agriculture is experiencing a profound shift driven by advancements in technology, with a focus on transforming crop cultivation and management practices. One of the primary challenges confronting farmers worldwide is the efficient identification and control of weeds and diseases in crop fields, which have significant implications for crop health and yield. Traditional detection methods are often characterized by labor intensiveness and time consumption, leading to the excessive use of pesticides and herbicides, resulting in adverse effects on both the environment and economic sustainability. In response, modern farming is increasingly turning to innovative technologies, including machine learning, computer vision, and sensor networks, to transform the detection of weeds and diseases. This survey paper examines the ongoing agriculture's paradigm shift towards precision and sustainability, with a particular emphasis on the role played by autonomous robotic systems and deep learning algorithms in the analysis of crop imagery. By addressing the pressing issues of food security worldwide and ecosystem preservation, these technologies present promising solutions for fostering a more sustainable and productive agricultural landscape.*

**Keywords:** Agriculture, weed detection, crop disease detection