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AI Based Precision Sprayer for Targeted Diseased Plants Management

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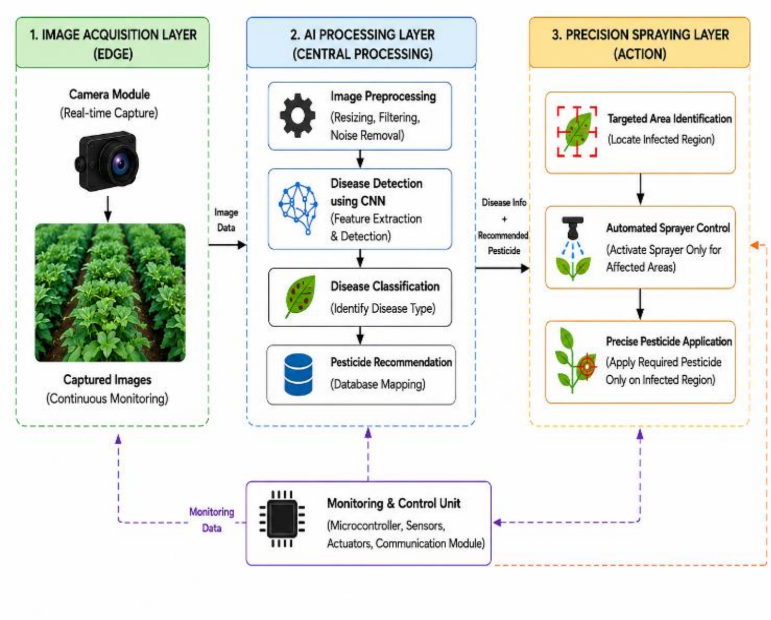
Abstract: *This paper proposes an AI-Based Precision Sprayer system that is used for precise plant disease management in agricultural contexts. The system is meant to be an improvement to conventional methods of spraying pesticides. In typical farming fields, farmers spray pesticides all over the crops in a field. This can result in a lot of inefficiency, higher costs and pollute the environment. This paper proposes to integrate computer vision, machine learning and a sprayer to create a system that can precisely spray the required pesticides to the affected parts of the plants. The proposed system uses a camera for image processing and uses Convolutional Neural Networks (CNNs) to recognize diseases in plants. After the recognition of diseases in plants, the proposed system enables the precision spraying unit to spray the required pesticides only to the affected parts of the plants thus preventing the use of excessive amounts of pesticides that can harm other parts of the plants and the environment. This proposed system will thus facilitate the healthy growth of the crops, promote green agriculture, and enable the farmers to manage plant diseases promptly and productively.*

Key Words: *Artificial Intelligence (AI), Precision Agriculture, CNN, Plant Disease Detection, Smart Spraying System, Machine Learning.*

I.INTRODUCTION

Agriculture is one of the key drivers of economic growth and food security. However, plant diseases have a major impact on crop yields and quality. Existing methods of controlling diseases with pesticides are often ineffective and result in overuse of pesticides, pollution and high production costs. However, with the advent of Precision Agriculture using AI, machine learning and computer vision techniques it is now possible to adopt smarter farming practices.



AI-Based Precision Sprayer for Targeted Disease Management is a proposed system that utilizes a camera and image processing as well as deep learning to detect diseased plants in real time. It will be able to recognize and identify diseases in order to automatically spray affected areas with pesticides only, thereby reducing the amount of pesticides used and keeping healthy plants intact to promote their growth to enhance crop health and sustain agriculture while reducing costs and minimizing environmental pollution and impacts.

Additionally, the system enables early disease detection, helping farmers take timely action and prevent large-scale crop damage. By integrating AI, automation, and smart spraying technology, the proposed system provides an efficient, eco-friendly, and cost-effective solution for modern precision farming.

II.LITERATURE SURVEY

Mudassir Iftikhar, Irfan Ali Kandhro, Neha Kausar, et al., "Plant disease management [1]: a fine-tuned enhanced CNN approach with mobile app integration for early detection and classification," proposed a fine-tuned CNN-based framework integrated with a mobile application for real-time plant disease detection. Their model achieved high classification accuracy and enabled farmers to monitor crop health efficiently through mobile platforms. However, the system required large training datasets and higher computational resources, suggesting the need for lightweight AI models for edge devices.

Archana Buddham Pahurkar and Ravindra Madhukarrao Deshmukh, "SMoGW-based deep CNN [2]: Plant disease detection and classification using SMoGW-deep CNN classifier," introduced an enhanced deep CNN architecture for plant disease classification. The proposed SMoGW-based model improved feature extraction and disease identification accuracy compared to traditional CNN approaches. Despite improved performance, the model complexity increased computational cost, indicating the need for optimization in real-time agricultural systems.

Payam Delfani, Vishnukiran Thuraga, Bikram Banerjee, et al., "Integrative approaches in modern agriculture [5]: IoT, ML and AI for disease forecasting amidst climate change," explored the integration of IoT, machine learning, and AI technologies for agricultural disease prediction. Their work highlighted the importance of smart farming systems in improving crop monitoring and resource optimization. However, issues related to data interoperability and infrastructure costs were identified as major limitations.

Harry Rogers, Beatriz De La Iglesia, Tahmina Zebin, et al., "Advancing precision agriculture [6]: domain-specific augmentations and robustness testing for convolutional neural networks in precision spraying evaluation," investigated CNN-based precision agriculture systems for targeted pesticide spraying. Their experiments demonstrated improved robustness and detection accuracy using domain-specific augmentations. However, the system performance varied under changing environmental conditions, requiring more adaptive AI techniques.

"Field evaluation of a deep learning-based smart variable-rate sprayer for targeted application of agrochemicals, [7]" evaluated a deep learning-driven precision spraying system for targeted pesticide application. The study confirmed that variable-rate spraying significantly reduced pesticide consumption while maintaining effective crop protection. Limitations included hardware complexity and dependence on accurate disease localization.

"Next generation of computer vision for plant disease monitoring in precision agriculture [8]: A contemporary survey, taxonomy, experiments, and future direction," reviewed modern computer vision techniques for disease monitoring in precision agriculture. The paper emphasized the growing role of AI and deep learning in automated crop protection systems. Nevertheless, real-time deployment and computational efficiency remained significant research challenges.

Shkelqim Sherifi, "A Compact and Efficient 1.251 Million Parameter Machine Learning CNN Model PD36-C for Plant Disease Detection [9]: A Case Study," proposed a lightweight CNN architecture optimized for plant disease detection. The compact model reduced computational requirements while maintaining high accuracy, making it suitable for edge-based agricultural devices. Future improvements could include integration with IoT-enabled precision spraying systems.

Affan Yasin and Rubia Fatima, "On the Image-Based Detection of Tomato and Corn Leaves Diseases [10]: An In-Depth Comparative Experiments," analyzed various CNN architectures for detecting tomato and corn leaf diseases. Their comparative experiments demonstrated that deep learning models outperform conventional machine learning algorithms in image-based disease classification. However, dataset imbalance and environmental variability affected detection consistency.

Abhishek Upadhyay, Narendra Singh Chandel, Krishna Pratap Singh, et al., "Deep Learning and Computer Vision in Plant Disease Detection [13]: A Comprehensive Review of Techniques, Models, and Trends in Precision Agriculture," provided a detailed survey of deep learning and computer vision techniques in agriculture. The paper discussed modern CNN architectures, challenges, and future trends in AI-based crop disease detection. The authors identified computational efficiency and field adaptability as major research areas.

Srinivas Kanakala and Sneha Ningappa, "Detection and Classification of Diseases in Multi-Crop Leaves Using LSTM and CNN Models,[19]" developed a hybrid LSTM-CNN model for disease detection in multiple crop types. Their model improved sequential feature learning and classification efficiency for agricultural applications. The study suggested future optimization for lightweight real-time deployment on embedded systems

III.PROBLEM STATEMENT

Modern agriculture relies heavily on chemical pesticides to protect crops from a wide variety of diseases and pests. However, conventional methods for applying these chemicals—such as blanket field spraying—are both inefficient and unsustainable. Pesticides are often applied uniformly, without considering whether individual plants are actually diseased, leading to unnecessary chemical exposure of healthy plants and the surrounding environment. This overuse not only increases operational costs for farmers but also accelerates soil degradation, contaminates waterways, and disrupts local ecosystems. Moreover, excessive pesticide application is linked to the development of resistant pest and pathogen strains, diminishing long-term effectiveness and posing risks to food security.

Farmers face additional challenges in timely disease identification and intervention. Manual scouting and visual inspection are labor-intensive, time-consuming, and prone to human error. The lack of precise targeting means many diseases go untreated until visible symptoms become severe, resulting in significant crop yield losses. Meanwhile, awareness is growing about the negative impacts of chemical agriculture, creating a demand for smarter, greener solutions aligned with global sustainability goals.

Therefore, there is an urgent need for a robust system that can detect diseased crop areas in real-time and administer targeted pesticide treatments. Such a solution must reduce chemical usage, lower input costs, protect healthy plants and biodiversity, and support the long-term viability of agricultural production.

IV.OBJECTIVES

The proposed AI-Based Precision Sprayer system aims to develop a real-time plant disease detection framework using advanced image processing and machine learning techniques to accurately identify healthy and diseased plants directly in the field. The system incorporates a targeted precision spraying mechanism that automatically applies pesticides only to the affected areas, thereby ensuring efficient chemical utilization and minimizing waste.

To enhance treatment effectiveness, a disease-pesticide mapping database is integrated to recommend the most suitable pesticide for each detected disease, enabling timely and appropriate intervention. Furthermore, the system promotes environmentally responsible agriculture by reducing pesticide runoff, minimizing exposure to non-target plants and organisms, and supporting ecological sustainability.

By lowering chemical consumption and improving disease management, the proposed solution helps reduce operational costs while increasing crop yield and farmer productivity. Additionally, the scalable and adaptable design of the system makes it suitable for various crops and farming environments, encouraging the adoption of sustainable precision agriculture practices and helping farmers meet modern food quality and safety standards.

V.PROPOSED SYSTEM ARCHITECTURE

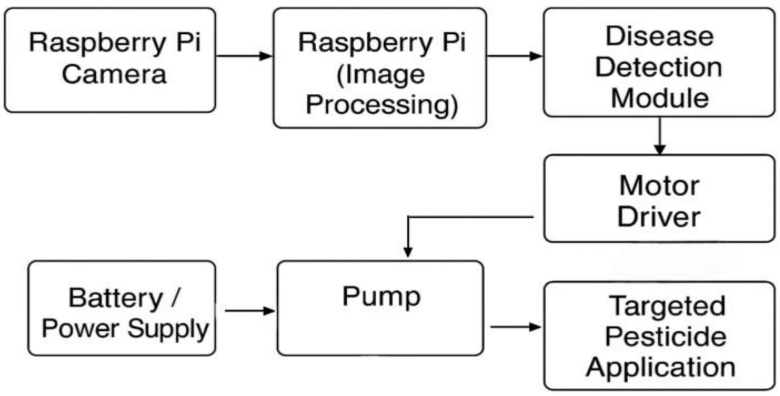


Fig. 2 Overall System Architecture

The proposed AI-Based Precision Sprayer is designed to enable real-time identification and targeted treatment of diseased plants in agricultural fields. It adopts a modular and scalable design to ensure high performance, adaptability to various crops and field conditions, and seamless integration with existing farming infrastructure. The architecture comprises several functional layers, each responsible for specific roles critical to the system's reliability and efficiency.

At the foundation lies the Data Acquisition Layer, where high-resolution RGB or multispectral cameras mounted on drones, tractors, or fixed stations continuously capture images or video streams of crops. This layer ensures uninterrupted data flow to support live monitoring and immediate response. The captured raw imagery serves as the input for subsequent processing stages.

The Preprocessing Layer addresses common challenges in field imaging, such as variable lighting, background interference, and image noise. Techniques including image resizing, color normalization, and data augmentation (e.g., rotation, flipping, scaling) standardize input data, enhancing the robustness of disease detection models trained under diverse conditions.

Central to the system is the Disease Detection Layer, which leverages cutting-edge deep learning models, such as convolutional neural networks and transfer learning architectures (e.g., MobileNetV2, YOLOv5), to detect and classify diseased plants. Upon detection, the system isolates regions of interest for targeted spraying, achieving high accuracy and minimal latency.

The Spraying Control Layer translates detection results into precise actuations of electronically controlled spray nozzles. Using GPS and sensor fusion, this layer ensures pesticides are released only on affected plants, optimizing chemical usage and reducing environmental impact.

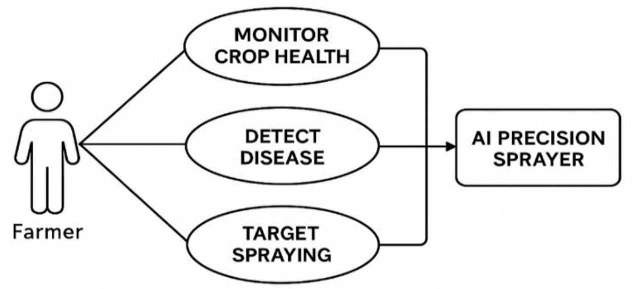
A Data Management and Monitoring Layer handles the storage of imagery, classification results, spray activity logs, and environmental data. It provides an intuitive user interface displaying real-time status, alerts, and historical analytics. This layer supports remote access and provides tools for model retraining by incorporating new field data.

Finally, the Feedback and Decision-Making Layer continuously evaluates system performance through metrics like accuracy, precision, recall, and F1-score. It triggers alerts for abnormal detections and initiates retraining processes to adapt to emerging diseases and changing field conditions. The architecture supports both edge and cloud deployments, balancing low latency and scalability, with robust encryption and privacy controls safeguarding farmer data.

VI.METHODOLOGY

AI-Based Precision Sprayer System in Agriculture is an innovative solution designed to automate crop health monitoring and targeted pesticide application, streamlining traditional farming practices. At its core, the system acquires high-quality images from cameras in the field, which are then pre-processed to standardize for variable environmental conditions. Advanced AI models, such as convolutional neural networks, quickly analyze these images to detect and classify diseased plants with high accuracy. Once a disease is identified, the targeted spraying control system applies pesticides only to affected areas, minimizing environmental impact and chemical waste. All detection results, spraying actions, and field status reports are stored for monitoring and later analysis, enabling continuous system improvement through feedback and retraining modules. Users and operators interface with the system

via intuitive dashboards, receiving real-time alerts and updates, and have the flexibility to access and manage operations remotely. This modular architecture allows for easy expansion, integration, and adaptation to different crops and farm sizes, supporting sustainable and efficient agriculture that leverages the power of AI and data-driven decision-making.



The Data Flow Diagram (Figure 3.3.3) for the AI-Based Precision Sprayer System illustrates how data moves through the various components involved in detecting diseases and precisely spraying pesticides. The process starts with the acquisition of real-time images from cameras installed on drones or other field equipment. These raw images are sent to the preprocessing unit, where image normalization and enhancement take place to improve detection accuracy. The processed images are then fed to the AI-based Disease Detection module, which analyzes and classifies diseased plants. Based on the detection results, the decision-making logic determines the appropriate pesticide and whether spraying is necessary. Commands are sent to the Targeted Spraying Control system to activate specific spray nozzles only at affected areas, optimizing chemical usage.

All data including images, detection outcomes, and spraying logs are stored in the Data Storage and Monitoring module to provide users with real-time monitoring and historical analysis capabilities. This module also supports feedback for model retraining to improve system accuracy over time. Additionally, the User Interface allows farmers or operators to monitor system status, control operations, and receive alerts. Remote Access components enable authorized personnel to view and interact with the system from distant locations, enhancing flexibility and rapid response. This data flow ensures efficient, timely, and environmentally-conscious management of plant health, illustrating a well-integrated, intelligent precision agriculture system.

VII. HARDWARE AND SOFTWARE REQUIREMENTS

The hardware architecture of the proposed AI-Based Precision Sprayer system consists of several interconnected components that work together to perform real-time plant disease detection and automated pesticide application. At the core of the system is the **Raspberry Pi**, which functions as the central processing and control unit. Equipped with a high-performance 64-bit quad-core ARM Cortex-A76 processor, the Raspberry Pi 5 provides sufficient computational power to execute image processing algorithms, run machine learning models for disease classification, and manage communication between all hardware modules. It acts as the decision-making center of the system by analyzing captured images, identifying plant diseases, and generating appropriate control signals for the spraying mechanism. Its advanced processing capabilities enable real-time operation, making the system suitable for precision agriculture applications.

The **Pi Camera Module** serves as the image acquisition component of the system. It continuously captures high-resolution images of plant leaves and stems under field conditions. These images are transmitted to the Raspberry Pi for preprocessing and analysis. Using computer vision and deep learning techniques, the captured images are examined to detect visible symptoms such as leaf spots, discoloration, blight, mildew, and other disease indicators. The camera module plays a crucial role in ensuring accurate and timely disease identification, which is essential for effective crop management and reducing yield losses.

The **DC Water Pump** functions as the pesticide delivery mechanism. Once a disease is detected and classified, the Raspberry Pi activates the pump to spray the appropriate pesticide solution onto the affected plant area. The pump transfers liquid from a storage reservoir through a network of tubes and nozzles, ensuring targeted application rather than indiscriminate spraying across the entire field. This selective spraying approach significantly reduces pesticide wastage, lowers operational costs, and minimizes environmental contamination.

To regulate the operation of the pump, an **L298N Motor Driver Module** is incorporated into the system. The motor driver acts as an interface between the low-power control signals generated by the Raspberry Pi and the higher-power requirements of the DC pump. It enables precise control over the pump's activation, speed, and operating duration, ensuring that only the required amount of pesticide is dispensed. The motor driver also provides electrical isolation and protection for the Raspberry Pi, improving the reliability and safety of the overall system.

Together, these hardware components create an intelligent and automated precision agriculture platform capable of detecting plant diseases in real time and applying pesticides only where necessary. The integration of image processing, machine learning, and automated spraying technology enhances crop protection, reduces chemical usage, promotes sustainable farming practices, and improves agricultural productivity.

VIII. EXPERIMENTAL RESULTS

The designed system utilizes a real-time communication paradigm for efficient monitoring and control. The data from the camera and sensor modules is continuously communicated to the processing unit in real time via wired or wireless means.

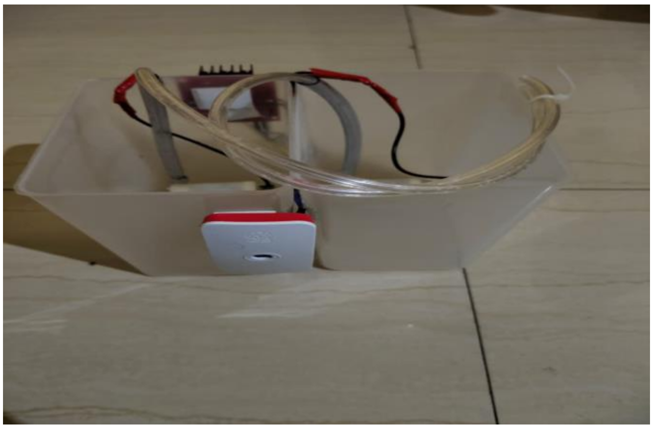


Fig.4 Working Protype

The AI algorithm analyzes the images acquired and classifies the diseased plants by applying machine/deep learning algorithms. After classifying the disease, the pesticide database searches for the required data, and control signals are sent to operate the spraying equipment.

The communication design provides minimum latency for fast and efficient responses towards disease prevention. The scalable architecture will allow for incorporating the cloud and Internet of Things technologies.

Fig. 5 Disease Detection and Spraying Pesticide

The newly proposed AI-Based Precision Sprayer was found to offer considerable advancements compared to conventional pesticide application practices. In conventional practice, pesticides are applied uniformly in a field leading to high use of chemicals and pollution of the environment.

As opposed to this, the suggested solution uses AI-enabled plant disease detection, as well as pesticide spray only on diseased parts of plants. This helped reduce pesticide waste and increase the efficiency of spraying.

Using the suggested solution was much more efficient since it required less manual labor and allowed for managing diseases before they spread. Moreover, the modular nature of the solution allows it to be easily customized according to needs and specific agricultural environments.

AI-based tomato disease detection and precision spraying system. A webcam captures images of the tomato plant, and the laptop processes them using a machine learning model to identify diseases such as Late Blight. Based on the detection result, the connected spraying setup can be used to apply treatment precisely to the affected plant, reducing chemical waste and improving crop health.

IX.ADVANTAGES

The proposed AI-Based Precision Sprayer for Targeted Diseased Plant Management offers numerous advantages that contribute to efficient, economical, and sustainable agricultural practices. By integrating artificial intelligence, computer vision, and automated spraying technologies, the system enables precise identification and treatment of diseased plants in real time. One of its primary benefits is **targeted spraying**, where pesticides are applied only to infected areas identified by the AI model, significantly reducing chemical wastage and preventing unnecessary exposure of healthy plants to pesticides. This selective application helps **minimize environmental impact** by reducing soil contamination, water pollution, and harmful effects on beneficial organisms, thereby promoting eco-friendly farming practices.

The system also provides substantial **cost savings** by optimizing pesticide usage and reducing labor requirements through automation. Farmers can lower operational expenses while achieving better disease control. Furthermore, the AI-based vision system supports **early disease detection**, allowing symptoms to be identified before they spread extensively throughout the crop. Early intervention helps prevent major crop losses and improves the effectiveness of disease management strategies. As a result, the system contributes to **improved crop yield and quality**, ensuring healthier plants, enhanced productivity, and higher market value of agricultural produce.

Another significant advantage is the **automation of monitoring and spraying operations**, which reduces the need for continuous manual inspection and pesticide application. This not only saves time and labor but also improves consistency and accuracy in farm management. The system generates valuable plant health information through continuous image analysis, enabling **data-driven decision-making** and helping farmers make informed choices regarding crop treatment and resource allocation. Additionally, the proposed solution is highly **scalable and adaptable**, making it suitable for different crop varieties, greenhouse environments, and open-field agricultural conditions, regardless of farm size.

The system operates in **real time**, allowing immediate detection and treatment of diseased plants, which improves response speed and treatment accuracy. Its modular architecture also facilitates future integration with advanced technologies such as IoT-based monitoring, cloud analytics, and autonomous agricultural robots. Overall, the AI-Based Precision Sprayer supports the principles of **sustainable agriculture and precision farming** by promoting efficient resource utilization, reducing chemical dependency, enhancing environmental protection, and improving overall agricultural productivity. These advantages make the proposed system a promising solution for modern smart farming applications and future agricultural development.

X.APPLICATIONS

The proposed AI-Based Precision Sprayer for Targeted Diseased Plant Management has a wide range of applications in modern agriculture and smart farming systems. One of its primary applications is in **crop disease detection and treatment**, where the system automatically identifies infected plants using artificial intelligence and computer vision techniques and applies pesticides only to the affected areas. This targeted approach helps prevent the spread of diseases while minimizing chemical usage. The system is also highly beneficial for **smart greenhouse monitoring**, where continuous surveillance of plant health can be performed without human intervention. Automated disease detection and precision spraying ensure optimal growing conditions and improve crop productivity within controlled environments.

In large-scale agricultural operations, the technology can be deployed for **field-level precision spraying** by integrating it with drones, autonomous vehicles, or robotic platforms. This enables efficient monitoring and treatment of extensive crop fields while reducing labor requirements and operational costs. The system can also be used for **weed and pest control**, where AI-based image analysis differentiates between crops, weeds, and pests, allowing selective spraying and protecting healthy plants from unnecessary chemical exposure. Furthermore, the technology supports **nutrient deficiency detection** by identifying visual symptoms caused by nutrient imbalances and applying corrective foliar sprays precisely where needed, thereby improving plant growth and development.

Another important application is **crop health mapping**, where images and sensor data collected from the field are analyzed to generate digital maps indicating plant health conditions, disease hotspots, and treatment requirements. These maps provide valuable insights for farmers and support data-driven farm management decisions. The system can also be incorporated into **automated farming systems** by integrating it with IoT devices, wireless communication networks, and robotic platforms, enabling fully automated crop monitoring and disease management operations. In addition, the proposed system serves as a useful tool for **agricultural research and development**, allowing researchers to study disease progression, evaluate pesticide effectiveness, analyze crop responses, and develop improved sustainable farming practices.

By ensuring timely disease detection and accurate pesticide application, the system contributes significantly to **yield optimization**, reducing crop losses and improving both the quantity and quality of agricultural produce. Moreover, it plays a crucial role in promoting **sustainable agriculture and resource conservation** by reducing excessive chemical usage, minimizing environmental pollution, conserving water and agricultural inputs, and enhancing food safety. Overall, the AI-Based Precision Sprayer provides a versatile and intelligent solution that supports modern precision agriculture, smart farming initiatives, and environmentally responsible crop management practices.

XI.CONCLUSION

The suggested "AI-Based Precision Sprayer for Targeted Disease Management" is a state-of-the-art technique which combines modern technology such as artificial intelligence, computer vision, machine learning, and automation to enhance modern agricultural techniques. The new technique has the ability to detect any diseases in plants in real time using image processing techniques based on Convolutional Neural Network. The spraying of pesticides is restricted to those areas that require it, thus reducing the use of pesticides in the environment.

The use of the technology allows the farmer to minimize the cost incurred while growing crops, promote the well-being of the plants, and increase agricultural production. The ability to detect any infection early enough and deal with it saves the farmer from losing a lot of crops. Besides, this technology is labor saving for the farmer since there is automation in spraying and monitoring.

The suggested solution will also contribute to sustainable and environmentally friendly farming through the optimized use of resources as well as the maintenance of soil quality. Being modular and scalable, the solution can be adjusted to fit any type of crop or farm. In general, the AI-Based Precision Sprayer represents the potential value of intelligent farming technologies in achieving precision farming.

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Reference

1. Mudassir Iftikhar, Irfan Ali Kandhro, Neha Kausar, et al., “Plant disease management: a fine-tuned enhanced CNN approach with mobile app integration for early detection and classification,” Artificial Intelligence Review, vol. 57, 2024.
2. Archana Buddham Pahurkar and Ravindra Madhukarrao Deshmukh, “SMoGW-based deep CNN: Plant disease detection and classification using SMoGW-deep CNN classifier,” Web Intelligence, 2023.
3. Tingting Shi, Yongmin Liu, Xinying Zheng, et al., “Recent advances in plant disease severity assessment using convolutional neural networks,” Scientific Reports, vol. 13, 2023.
4. Wubetu Barud Demilie, “Plant disease detection and classification techniques: a comparative study of the performances,” Journal of Big Data, vol. 11, 2024.
5. Payam Delfani, Vishnukiran Thuraga, Bikram Banerjee, et al., “Integrative approaches in modern agriculture: IoT, ML and AI for disease forecasting amidst climate change,” Precision Agriculture, vol. 25, 2024.
6. Harry Rogers, Beatriz De La Iglesia, Tahmina Zebin, et al., “Advancing precision agriculture: domain-specific augmentations and robustness testing for convolutional neural networks in precision spraying evaluation,” Neural Computing and Applications, vol. 36, 2024.
7. “Field evaluation of a deep learning-based smart variable-rate sprayer for targeted application of agrochemicals,” Smart Agricultural Technology, vol. 3, 2023.
8. “Next generation of computer vision for plant disease monitoring in precision agriculture: A contemporary survey, taxonomy, experiments, and future direction,” Information Sciences, vol. 665, 2024.
9. Shkelqim Sherifi, "A Compact and Efficient 1.251 Million Parameter Machine Learning CNN Model PD36-C for Plant Disease Detection: A Case Study," arXiv preprint arXiv:2604.11332, 2026.
10. Affan Yasin and Rubia Fatima, "On the Image-Based Detection of Tomato and Corn Leaves Diseases: An In-Depth Comparative Experiments," arXiv preprint arXiv:2312.08659, 2023.
11. Sourish Suri and Yifei Shao, "Automated Multi-Class Crop Pathology Classification via Convolutional Neural Networks: A Deep Learning Approach for Real-Time Precision Agriculture," arXiv preprint arXiv:2507.09375, 2025.
12. Andre S. Abade, Paulo Afonso Ferreira, and Flavio de Barros Vidal, "Plant Diseases Recognition on Images Using Convolutional Neural Networks: A Systematic Review," arXiv preprint arXiv:2009.04365, 2020.
13. Abhishek Upadhyay, Narendra Singh Chandel, Krishna Pratap Singh, et al., "Deep Learning and Computer Vision in Plant Disease Detection: A Comprehensive Review of Techniques, Models, and Trends in Precision Agriculture," Artificial Intelligence Review, vol. 58, 2025.
14. Vijaypal Singh Dhaka, Nidhi Kundu, Geeta Rani, et al., "Role of Internet of Things and Deep Learning Techniques in Plant Disease Detection and Classification: A Focused Review," Sensors, vol. 23, no.18, 2023.
15. W. Shafik, A. Tufail, A. Namoun, et al., "A Systematic Literature Review on Plant Disease Detection: Motivations, Classification Techniques, Datasets, Challenges, and Future Trends," IEEE Access, vol.11, 2023.
16. M. Ramanjot et al., "Plant Disease Detection and Classification: A Systematic Literature Review," Sensors, vol.23, no.10, 2023.
17. Sana Parez, Naqqash Dilshad, Norah Saleh Alghamdi, et al., "Visual Intelligence in Precision Agriculture: Exploring Plant Disease Detection via Efficient Vision Transformers," Sensors, vol.23, no.15, 2023.
18. Pulicherla Siva Prasad and Senthilrajan Agniraj, "C-MAN: A Multi-attention Approach for Precise Plant Species Classification and Disease Detection Using Multi-scale, Channel-wise and Cross-modal Attentions," Traitement du Signal, vol.41, no.3, 2024..
19. Srinivas Kanakala and Sneha Ningappa, “Disease Detection and Classification on Multi-Crop Leaves Using LSTM and CNN Model,” arXiv Preprint, 2025.
20. Sourish Suri and Yifei Shao, “Multi-Class Automated Crop Pathology Classification Using Convolutional Neural Networks: A Deep Learning Approach,” arXiv Preprint, 2025.