International Journal of Scientific Research and Engineering Development-– Volume 8 Issue 2, Mar-Apr 2025

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Precision Farming Advisor

Caroline Grace L*, Ms. Agnes A **

*(Student, Computer Science and Engineering, Francis Xavier Engineering College, Tirunelveli
carolinegracel.ug.21.cs@francisxavier.ac.in)

** (Assistant Professor, Information and Technology, Francis Xavier Engineering College, Tirunelveli
agnes@francisxavier.ac.in)

--************************----------------------------------

Abstract:

Agricultural productivity is vital for economic growth and food security, yet many farmers face challenges in optimizing crop yield due to inadequate knowledge of soil suitability, weather conditions, and pest management. Traditional experience-based decision-making often leads to inefficiencies, while incorrect fertilizer use contributes to soil degradation and lower yields. Smart farming technologies, including IoT-based surveillance, AI-driven analytics, and remote sensing, provide real-time insights into soil health, weather patterns, and crop conditions, allowing farmers to make data-driven decisions for better productivity and resource efficiency. Digital advisory systems and mobile applications offer personalized recommendations, while blockchain enhances supply chain transparency, ensures fair pricing, and reduces exploitation. Precision agriculture optimizes water and fertilizer usage, minimizing environmental impact and improving sustainability. Automated irrigation and fertilization systems further enhance resource management, reducing waste and promoting healthier soil. Satellite monitoring and drone-based assessments enable early detection of crop diseases and targeted interventions, preventing losses and ensuring timely action. Additionally, integrating big data analytics with predictive modeling helps anticipate risks, allowing proactive farming strategies. Government initiatives and public-private partnerships play a crucial role in funding, training, and infrastructure development, ensuring wider adoption of intelligent agricultural solutions. By leveraging technology, the agricultural sector can enhance productivity, sustainability, and resilience, addressing food security challenges and mitigating the impact of climate change while improving farmer livelihoods and global economic stability.

***Keywords* — Agricultural Productivity, Food Security, Smart Farming, Precision Agriculture, Sustainable Farming, Crop Disease Detection, Digital Advisory Systems, Fertilizer Optimization, Pest Management, Resource Efficiency, Farmer Decision Support Systems.**

--************************----------------------------------

I. INTRODUCTION

Improving agricultural productivity is key to ensuring nutritional safety and maintaining economic stability. However, many farmers face challenges when selecting the right plants due to different soil conditions, climate and environmental factors. In the past, farmers have relied on personal experience and traditional knowledge, which is not always consistent with modern scientific research. As agricultural practices become more complex, the integration of data-controlled technologies such as machine learning and remote sensing represents a promising solution. Through analysis of factors such as soil characteristics, climate data, and historical harvest performance, machine learning models can provide accurate recommendations for harvesting and accurate yield predictions, helping farmers make informed decisions to optimize productivity.

Several studies have examined the possibilities of machine learning in precision agriculture. Singh, Kumar, and Mehta [1] proposed a machine learning-based recommendation system that uses soil and climate data to support farmers in the optimal harvest decision-making process. Your research shows how a data-controlled approach can improve decision-making and improve yield outcomes. Similarly, Zhang, Wu, and Li [2] examined the integration of remote sensing and machine learning models to predict crop yields, demonstrating the importance of real-time environmental monitoring in agricultural planning.

Furthermore, Shah, Verma, and Kumar [3] conducted a comprehensive review of the application of machine learning in precision agriculture, as the ability to optimize resource use and improve the accuracy of revenue forecasts was highlighted. Ali, Khan, and Yousaf [4] have developed a framework for harvesting selections based on environmental and soil parameters, representing how analytical models evaluate different factors to determine the plants that are most suitable for a particular area.

Similarly, Guppa, Patel, and Joshi [5] have introduced an AI-based harvesting recommendation system that integrates multi-source data and algorithms for machine learning to improve the efficiency of decision-making in agriculture. Your research shows how important it is to combine a variety of data sources, including soil composition, weather patterns, and historical yields, to improve prediction accuracy.

Sharma, Gupa, and Patel [6] investigated a deep learning-based approach to harvest prediction. This has improved prediction methods using soil and weather data. Her research highlights the benefits of deep learning to record complex patterns in agricultural data records, leading to more accurate yield estimates.

Furthermore, Yadav, Kumar, and Rathi [7] demonstrated the effectiveness of remote sensing and machine learning for harvest classification and revenue forecasting, increasing the importance of satellites and aerial photography in modern agricultural practices.

The upcoming sections of this paper will explore the system's design, prediction approach, and assessment criteria, highlighting its contribution to enhancing forest fire prevention measures by improving early detection, response strategies, and risk management for minimizing environmental and economic damage.

II. OBJECTIVE

This project aims to develop a software-based agricultural solution that enhances efficiency, sustainability, and decision-making without requiring additional hardware. By utilizing artificial intelligence (AI), big data analytics, cloud computing, and blockchain, the system will modernize farming practices while promoting economic growth and environmental responsibility.

The agricultural sector is evolving rapidly through the adoption of advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), big data analytics, and precision farming, all of which enhance efficiency, sustainability, and economic resilience. Automated irrigation and fertilization systems optimize resource use, minimizing waste while supporting eco-friendly practices. Blockchain technology improves supply chain transparency, prevents fraud, and promotes fair trade, offering small and medium-sized farmers better pricing and market opportunities.

The main goal of this study is to develop and deploy a predictive system that combines weather information, data-driven risk analysis, and visualization tools to improve early fire detection and support decision-making. The system is designed to achieve the following specific objectives:

1.Data-Driven Decision Support:
A cloud-based farm management system will offer real-time insights into weather conditions, soil quality, and crop health. By analyzing historical and

live data, the software will generate actionable recommendations, enabling farmers to mitigate risks and enhance agricultural planning.

2.Supply Chain Transparency:
Blockchain integration will ensure a secure and traceable agricultural supply chain, allowing farmers, distributors, and retailers to track product movement and uphold fair trade practices. Smart contracts will simplify transactions and provide secure payment options.

3.Automated Farm Operations:
The system will streamline farm management by offering tools for scheduling tasks, maintaining records, and automating workflows. Features such as crop monitoring, inventory tracking, and market trend analysis will aid in better planning and cost control.

4.Sustainable Farming Practices:
By incorporating precision agriculture techniques, soil conservation strategies, and crop rotation guidance, the software will promote sustainable farming. It will help reduce reliance on chemicals, support organic practices, and monitor soil health for long-term agricultural viability.

5.Efficient Resource Management:
AI-powered analytics and predictive modeling will help optimize the use of water, fertilizers, and pesticides, reducing waste and environmental impact. The software will provide data-driven recommendations for irrigation, nutrient distribution, and pest control to improve crop productivity.

By accomplishing these goals, the system improves the accuracy of early fire detection, shortens response times, and supports forest conservation initiatives by enabling more effective, data-driven decision-making processes. This approach ultimately helps mitigate fire-related risks and promotes sustainable environmental management.

III. MODULE AND ALOGRITHM

To enhance agricultural productivity and sustainability, this system integrates artificial intelligence (AI), machine learning (ML), and data-driven insights across five key modules: Crop Suitability Analysis, Fertilizer Advisory, Plant Health Monitoring, Weather Forecasting, and Yield Projection. These modules work together to optimize farming operations, improve resource utilization, and mitigate environmental and biological risks.

A. Modules:

1. Crop Suitability Analysis
This module employs machine learning algorithms to assess soil characteristics and environmental conditions, identifying the most suitable crops for a given location. Key factors considered include soil nutrients (nitrogen, phosphorus, and potassium), pH levels, temperature, rainfall patterns, and geographic data. By leveraging predictive analytics, farmers can make informed decisions that enhance productivity while promoting sustainable land use.

2. Fertilizer Advisory
Designed to optimize soil fertility, this module evaluates nutrient composition and crop-specific requirements to generate precise fertilizer recommendations. By analyzing soil nutrient levels, it helps prevent deficiencies and overuse, ensuring balanced fertilization. This approach not only maintains soil health but also minimizes environmental pollution and supports sustainable farming practices.

3. Plant Health Monitoring
Utilizing AI-powered image recognition, this module detects early signs of plant diseases. Farmers can upload crop images, which are analyzed by deep learning models to identify symptoms such as discoloration, lesions, and pest infestations. By referencing an extensive plant disease database, the system provides accurate diagnoses and suggests effective treatments, helping reduce crop losses and unnecessary pesticide application.

4. Weather Forecasting

This module integrates real-time meteorological data with historical climate trends to generate accurate weather predictions. It analyzes key variables such as temperature, humidity, precipitation, wind speed, and seasonal patterns. By delivering timely alerts, farmers can adjust irrigation schedules, implement pest control strategies, and safeguard crops from extreme weather conditions, thereby minimizing yield risks.

5. Yield Projection

Using machine learning and advanced analytics, this module forecasts crop yields based on multiple factors, including soil health, climate variations, farming techniques, and historical productivity trends. It considers elements such as seed variety, irrigation efficiency, fertilizer application, and potential disease impact to provide realistic yield estimates. This enables farmers to plan storage, distribution, and market strategies effectively, enhancing profitability and ensuring food security.

B. Algorithm:.

The integration of Artificial Intelligence (AI) and Machine Learning (ML) in agriculture has significantly enhanced farming practices, enabling better decision-making, crop monitoring, and yield predictions. Two key algorithms—Random Forest (RF) and Convolutional Neural Networks (CNN)—are instrumental in optimizing agricultural processes, from crop selection to disease detection.

1. Crop Recommendation Using Random Forest

The Random Forest (RF) algorithm is widely used in agriculture for crop recommendation and yield estimation. By analyzing factors such as soil composition (nitrogen, phosphorus, potassium), pH levels, climate conditions, and geographic data, RF provides precise crop recommendations. Its ensemble learning approach improves accuracy and reliability, ensuring that farmers make informed decisions while maximizing productivity and resource utilization.

2. Disease Detection Using Convolutional Neural Networks (CNN)

Convolutional Neural Networks (CNN) are essential for plant disease detection through image-based analysis. Using deep learning techniques, CNNs can analyze leaf patterns, discoloration, and lesions to identify diseases with high accuracy. Farmers can upload images captured via smartphones, drones, or IoT-enabled cameras, enabling real-time diagnosis and timely intervention. This helps reduce crop losses and ensures targeted disease management strategies.

IV. METHODOLOGY

The proposed system integrates Random Forest (RF) and Convolutional Neural Networks (CNN) to enhance agricultural decision-making by offering precise crop recommendations and early disease detection. RF evaluates soil composition, climatic conditions, and geographical data to identify the most suitable crops for a specific region, ensuring efficient resource use. Meanwhile, CNN analyzes plant images to detect diseases, enabling timely interventions and improved disease management. By leveraging these machine learning models, the system promotes precision farming, reduces crop losses, and supports sustainable agriculture.

1. Data Collection

The system gathers agricultural data from multiple sources, focusing on soil properties, environmental factors, and plant health indicators. Key parameters include soil nutrients—particularly nitrogen (N), phosphorus (P), and potassium (K)—which are essential for crop growth. Soil pH levels are also analyzed to assess acidity or alkalinity, influencing crop suitability. Additionally, weather factors such as temperature, humidity, and precipitation are recorded to evaluate their impact on farming. Geographical information, including region-specific data, enhances the accuracy of location-based recommendations.

For disease detection, the system collects high-resolution images of plant leaves. These images undergo preprocessing steps, such as noise reduction, missing value handling, and inconsistency correction, ensuring high-quality data for machine learning analysis.

2. Crop Recommendation Using Random Forest (RF)

To determine the most suitable crops for a given region, the system employs the Random Forest (RF) algorithm, which evaluates soil characteristics, climatic factors, and historical agricultural data. The process starts with feature selection, where essential variables—including soil nutrient content, pH, moisture levels, and temperature—are extracted as input parameters.

The model is trained on historical farming records, enabling it to identify patterns and relationships between soil properties and crop yields. Once trained, the system predicts optimal crops based on growth potential, environmental adaptability, and expected yield. The ensemble learning approach of RF, which combines multiple decision trees, enhances prediction accuracy and reliability. This allows farmers to select high-yield crops, improving productivity and minimizing risks associated with poor crop choices.

3. Fertilizer Recommendation System

After identifying the ideal crop for a specific region, the system analyzes soil test results to provide precise fertilizer recommendations. It detects nutrient deficiencies in nitrogen, phosphorus, and potassium and suggests the appropriate fertilizer type and quantity based on the selected crop's nutritional needs.

This targeted fertilization approach ensures crops receive the necessary nutrients without excessive application, preventing soil degradation and environmental pollution. Additionally, it reduces farming costs, enhances soil fertility, improves plant health, and promotes sustainable agriculture.

4. Disease Detection Using Convolutional Neural Networks (CNN)

For early disease detection, the system integrates a CNN-based deep learning model. The process starts with image acquisition, where farmers capture and upload photos of affected plant leaves using smartphones or imaging devices. These images undergo preprocessing steps, including resizing, normalization, and augmentation, to enhance quality and improve model accuracy.

The CNN model then extracts visual features such as leaf texture, color variations, and lesion patterns to detect symptoms of plant diseases. It classifies the identified disease into categories—such as fungal, bacterial, or viral infections—and provides treatment recommendations. By enabling early detection, the system allows farmers to implement timely interventions, reducing crop damage and yield losses.

This AI-powered agricultural support system integrates advanced machine learning techniques to optimize farming decisions. The combination of Random Forest for crop selection, CNN for disease detection, and a yield prediction model enables farmers to make informed choices regarding land use, resource management, and risk mitigation. The inclusion of a web-based dashboard ensures that real-time insights are accessible and actionable, promoting sustainable and data-driven farming practices. By leveraging artificial intelligence, the system enhances productivity, reduces agricultural costs, and supports long-term food security, making farming more efficient and technologically advanced.

V. EXISTING SYSTEM

The current agricultural landscape relies heavily on conventional farming methods and manual decision-making. Farmers predominantly base their crop selection on personal experience, traditional practices, and historical trends rather than leveraging data-driven insights. While these methods have been in place for generations, they often fail to consider critical factors such as soil health, climate fluctuations, and emerging plant diseases. As a result, challenges such as low crop yields, soil degradation, and financial setbacks arise due to inefficient resource utilization and unpredictable environmental conditions.

1. Absence of Data-Driven Insights

Traditional agricultural practices primarily rely on experience-based decision-making rather than scientific data analysis. Farmers often determine crop selection, planting schedules, and fertilizer application based on past trends or regional practices, which may not always align with evolving environmental conditions. This lack of precise, real-time data makes it difficult to optimize productivity, leading to inefficient resource usage and lower yields. Without predictive analytics, farmers are unable to make well-informed choices that could enhance efficiency and sustainability in agriculture.

2. Inefficient Fertilizer Utilization

A significant shortcoming of the current system is the improper management of fertilizers due to a lack of soil analysis. Many farmers apply fertilizers based on general assumptions rather than specific nutrient deficiencies, resulting in either excessive or inadequate usage. Over-application contributes to soil depletion, water pollution, and unnecessary financial expenses, whereas insufficient fertilization restricts crop development and yield potential. The absence of a smart recommendation system to analyze soil composition and provide optimal fertilizer suggestions leads to long-term soil degradation and reduced agricultural sustainability.

3. Delayed and Inaccurate Disease Diagnosis

In the existing system, plant disease identification is largely dependent on farmers' visual assessments, which are often inaccurate and delayed. Many early-stage symptoms are not easily detectable without advanced diagnostic tools, resulting in late intervention and ineffective control measures. Misidentification may lead to incorrect pesticide use, causing further harm to crops and the environment. Without AI-based disease detection mechanisms, farmers are unable to detect plant health issues promptly, which significantly impacts crop productivity and profitability.

4. Uncertainty in Crop Planning and Yield Forecasting

Agricultural planning within the current system is highly unpredictable, as farmers lack access to advanced forecasting technologies. Decisions regarding planting schedules, irrigation strategies, and harvesting periods are often based on historical trends rather than real-time climate data and soil health parameters. The absence of predictive modeling makes farmers vulnerable to climate variability, extreme weather conditions, and soil fertility fluctuations, leading to inconsistent yields. Furthermore, the lack of AI-driven yield prediction tools prevents farmers from making proactive decisions to maximize agricultural output.

5. Limited Integration of Modern Technology

The traditional farming approach does not incorporate a centralized technological system that unifies critical agricultural data. Most farmers rely on multiple, often disconnected sources of information, such as government advisories, local consultants, and personal experience, which may not always be accurate or up to date. The lack of an integrated system that combines crop selection, fertilizer recommendations, disease detection, and predictive analytics creates barriers to effective decision-making. Additionally, limited access to emerging agricultural technologies further exacerbates the gap between conventional and precision farming methods.

6. Environmental and Financial Implications

Inefficiencies in fertilizer usage, disease management, and resource allocation have significant environmental and economic consequences. Overuse of fertilizers and pesticides leads to soil degradation, water contamination, and loss of biodiversity, while ineffective disease control results in crop failures and financial losses. The absence of data-driven agricultural solutions prevents sustainable farming, making the industry more susceptible to climate change, economic instability, and unpredictable market conditions.

VI. PROPOSED SYSTEM

This system integrates advanced machine learning techniques to enhance agricultural decision-making by optimizing crop selection, fertilizer recommendations, and disease detection. Utilizing Random Forest (RF) and Convolutional Neural Networks (CNN), it provides real-time insights, enabling farmers to make informed, data-driven choices that boost productivity and sustainability.

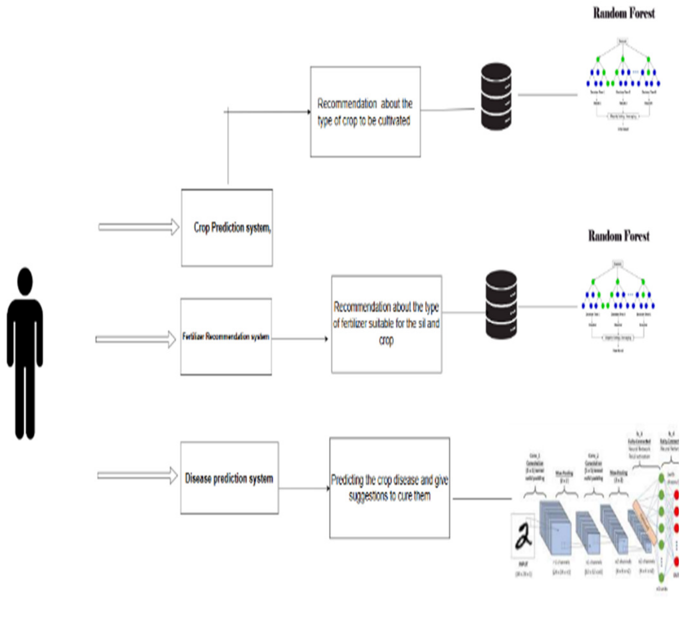

Fig1: Architecture diagram of precision farming advisor

1. Crop Prediction System

The crop prediction module employs the Random Forest algorithm to analyze crucial agricultural factors, including soil composition, climate conditions, and environmental parameters, to determine the most suitable crops for cultivation. Key inputs such as soil nutrient levels (N, P, K), pH value, temperature, humidity, and rainfall are processed to generate accurate recommendations. By reducing reliance on traditional guesswork, this system helps farmers maximize yields and improve efficiency.

2. Fertilizer Recommendation System

To ensure balanced soil fertility and optimal crop growth, this module leverages a Random Forest-based analysis to provide tailored fertilizer recommendations. By evaluating soil health indicators and nutrient availability, it determines the precise type and quantity of fertilizers required for specific crops. This approach prevents nutrient imbalances, minimizes excessive fertilizer use, and promotes eco-friendly farming while enhancing soil productivity and crop performance.

3. Disease Detection System

For early identification and management of plant diseases, this system utilizes Convolutional Neural Networks (CNN) to analyze leaf images and detect signs of infection. Farmers can upload images of affected crops, which the CNN model examines based on texture, color variations, and patterns to identify potential diseases. Once detected, the system provides treatment recommendations and preventive measures, allowing for timely intervention, reducing losses, and improving overall farm productivity.

4. Data Management and Storage

A centralized database is implemented to store and organize agricultural data, including soil test results, climate records, historical crop performance, and disease-related images. This structured data repository enables quick access to relevant information and enhances decision-making by integrating real-time data. Additionally, continuous learning from updated data helps refine model accuracy over time, ensuring adaptability to changing agricultural conditions.

VI. OUTPUT

Precision Farming Advisor Outcomes:

The Precision Farming Advisor offers valuable insights and guidance to optimize agricultural practices and improve crop yields. By processing data from various sources, such as soil health, weather conditions, and crop performance, the system provides personalized recommendations on irrigation, fertilization, and pest control. These tailored suggestions help farmers make informed decisions, reducing resource waste and increasing efficiency.

Additionally, the system promotes environmentally friendly farming by encouraging practices like efficient water use and minimizing the reliance on chemicals. With continuous monitoring and predictive analytics, the Precision Farming Advisor enables farmers to take proactive steps, leading to higher productivity, cost savings, and sustainable farming practices.

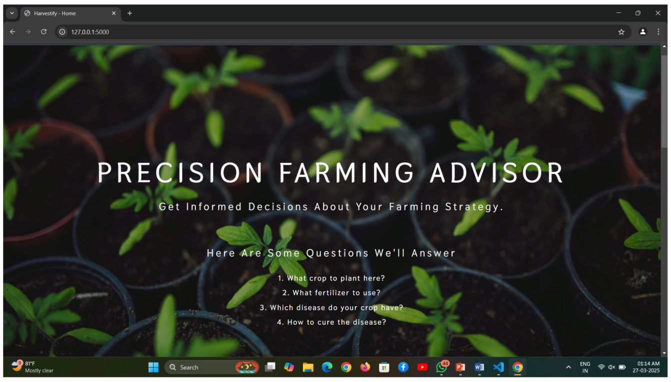

Fig 2: Precision Farming Advisor Interface

1. Optimized Crop Selection for Higher Yields

Machine learning enables farmers to identify the most suitable crops based on soil composition and environmental conditions. This improves land utilization, boosts productivity, and reduces the chances of crop failure. By selecting crops that align with soil health and water availability, farmers can achieve sustainable and efficient farming practices.

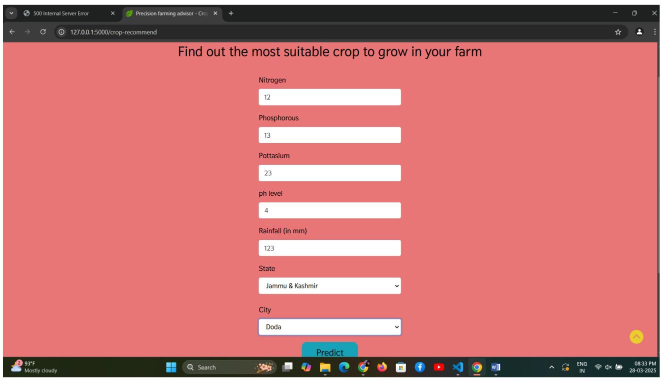

Fig 3: Crop Recommendation Interface

2. Precision Fertilizer Use and Soil Health Management:

The system delivers accurate fertilizer recommendations, preventing both overuse and deficiency. This ensures crops receive balanced nutrients (N, P, K) while preserving soil fertility.

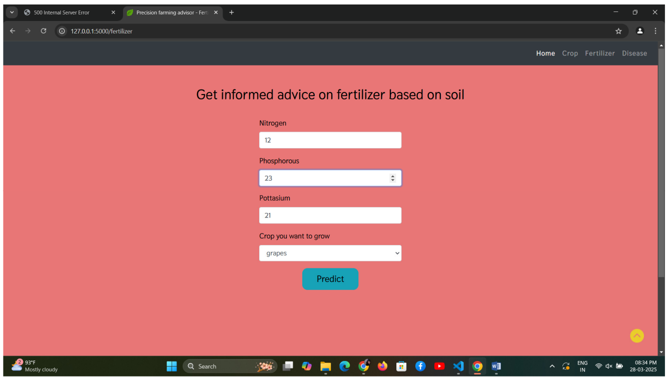

Fig 4:Fertilizer Recommendation Interface

3. Early Disease Detection and Targeted Crop Protection

AI-powered image analysis helps detect plant diseases at an early stage, enabling farmers to take prompt corrective measures. This reduces severe crop damage and decreases reliance on excessive pesticide use. The system also provides tailored disease management strategies, including organic solutions, biological treatments, and targeted chemical applications, ensuring healthier crops.

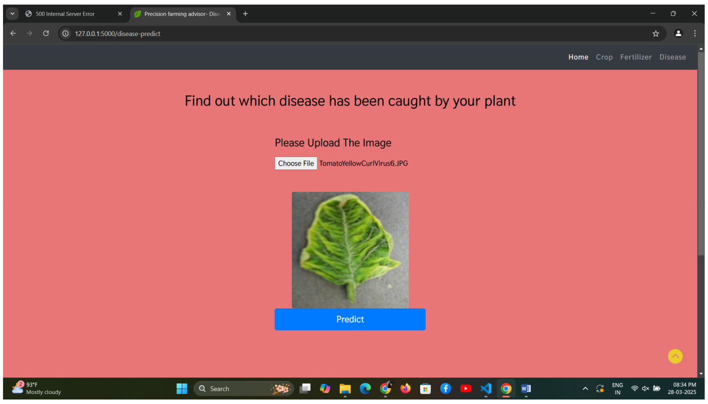

Fig. 5.: Plant disease detection Interface

VII. CONCLUSION

The Agricultural Intelligence System revolutionizes modern farming by integrating AI, machine learning, and data analytics. It provides farmers with tailored recommendations for crop selection, fertilizer application, disease prevention, weather forecasting, and yield estimation, helping to improve efficiency, reduce resource waste, and enhance profitability.

By analyzing soil quality, environmental conditions, and climate patterns, the system supports data-driven decision-making that fosters sustainable agricultural practices. Its ability to detect diseases early, optimize resource management, and generate accurate predictions minimizes risks related to crop loss and environmental impact.

Overall, this intelligent system offers a holistic approach to farming, enabling adaptability in a rapidly evolving agricultural landscape. By promoting eco-friendly solutions and leveraging advanced technology, it has the potential to reshape the industry and contribute to global food security.

Data-Driven Decision-Making

The system provides farmers with critical insights by analyzing soil composition, weather trends, and environmental factors. This minimizes guesswork, supports precision-based farming, and enhances overall productivity.

1.Smart Crop Selection

By assessing land characteristics, the system suggests the most suitable crops for specific conditions. This improves yield potential, optimizes resource use, and promotes long-term sustainability.

2.Optimized Fertilizer Management

Accurate fertilizer recommendations prevent both overuse and nutrient deficiencies, preserving soil health, reducing environmental pollution, and ensuring balanced crop nutrition.

3.Early Disease Detection

AI-powered image analysis detects plant diseases in their early stages, enabling timely intervention. This reduces crop loss, minimizes pesticide dependency, and supports healthier agricultural practices.

4.. Data-Driven Decision-Making

The system provides farmers with critical insights by analyzing soil composition, weather trends, and environmental factors. This minimizes guesswork, supports precision-based farming.

ACKNOWLEDGMENT

I am deeply grateful for the guidance and mentorship of **Ms. Agnes A**, whose expertise and support have been instrumental in shaping this study. Her thoughtful insights have greatly enhanced the quality and depth of this research.

I would also like to extend my appreciation to everyone who contributed their ideas and provided constructive feedback. A special thanks goes to those who generously offered their time and knowledge, supplying essential information that strengthened the study. Their contributions were key in refining the conclusions and broadening the scope of this work.

Lastly, I wish to express my heartfelt thanks to my family, teachers, and peers for their constant support and encouragement. Their belief in me has played a crucial role in the successful completion of this project.

REFERENCES

[1] "A Machine Learning Approach to Crop Recommendation Based on Soil and Climate Data" Authors: A. Singh, R. Kumar, and P. Mehta. Year: 2023
DOI: 10.1109/ACCESS.2023.3289021

[2] "Predicting Crop Yields Using Machine Learning and Remote Sensing Data" Authors: L. Zhang, Y. Wu, and X. Li. Year: 2022 DOI: 10.1016/j.cageo.2022.105236

[3] "Precision Agriculture: A Review on the Application of Machine Learning for Crop Growth and Yield Prediction" Authors: S. Shah, P. Verma, and A. Kumar. Year: 2023
DOI: 10.1016/j.agsy.2023.102430

[4] "A Framework for Crop Selection Based on Environmental and Soil Factors Using Data Analytics"
Authors: M. Ali, F. S. Khan, and S. A. Yousaf. Year: 2022
DOI: 10.1109/JSTARS.2022.3234590

[5] "AI-Based Crop Recommendation System Using Multi-Source Data and Machine Learning Algorithms"
Authors: R. Gupta, V. Patel, and N. Joshi. Year: 2023
DOI: 10.1016/j.agrformet.2023.108896

[6] "Deep Learning for Crop Prediction Using Soil and Weather Data"
Authors: S. R. Sharma, H. Gupta, and R. S. Patel. Year: 2023
DOI: 10.1016/j.ecoinf.2023.101043

[7] "Using Remote Sensing Data and Machine Learning for Crop Classification and Yield Prediction"
Authors: K. Yadav, R. Kumar, and S. Rathi. Year: 2021
DOI: 10.1109/ACCESS.2021.3078400

[8] "A Hybrid Machine Learning Approach for Crop Selection and Yield Prediction"
Authors: J. T. Liao, M. H. Zhang, and C. Liu. Year: 2022
DOI: 10.1016/j.future.2022.05.035

[9] "Optimizing Crop Planning Using Machine Learning Models and Soil Quality Data"
Authors: L. P. Chen, J. F. Tan, and Y. S. Lin. Year: 2023
DOI: 10.1016/j.compag.2023.107402

[10] "Leveraging Remote Sensing and Machine Learning for Crop Yield Prediction and Decision Support"
Authors: A. S. Kumar, P. R. Jain, and R. Verma. Year: 2022
DOI: 10.1109/ACCESS.2022.3149225

[11]"Development of a Decision Support System for Crop Selection Using Weather and Soil Data"
Authors: V. S. Singh, P. C. Sharma, and K. R. Gupta. Year: 2023
DOI: 10.1016/j.agrformet.2023.109202

[12] "Application of Big Data and Machine Learning for Precision Agriculture and Crop Management"
Authors: J. H. Lee, S. S. Chang, and W. C. Chang. Year: 2021
DOI: 10.1109/JSTARS.2021.3073067

[13] "Data-Driven Crop Selection System Using Geospatial Data and Machine Learning Algorithms"
Authors: A. Kumar, S. B. Shah, and T. H. Patel. Year: 2022
DOI: 10.1016/j.ecoinf.2022.101157

