

Crop Monitoring System Using Satellite, Image Detection and AI & Weather Analysis

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Abstract: Agriculture is the backbone of India's economy, yet farmers continue to struggle with unpredictable weather, crop diseases, and limited access to modern technology. This project presents a Crop Monitoring Application, a free mobile solution developed over 44 days that brings precision agriculture within every Indian farmer's reach by combining three core technologies into one unified platform.

The application uses satellite imagery from NASA GIBS, Sentinel-2, and Landsat-8 to perform NDVI based vegetation health analysis, allowing farmers to monitor their entire field through colour coded maps without physically walking through it. For disease detection, farmers can photograph affected plants and receive instant AI powered diagnoses through the Plant.ID and Crop.Health APIs by Kindwise, further supported by Google Gemini AI which provides detailed explanations, spread patterns, and treatment recommendations in local languages. Weather monitoring is handled through the OpenWeatherMap API, delivering location specific forecasts, 7 day outlooks, and alerts for severe conditions tailored to Indian agricultural seasons like kharif and rabi.

The app was built with accessibility in mind, ensuring smooth performance on basic smartphones, simple navigation, and regional language support so farmers of all digital literacy levels can use it effectively. By bringing satellite monitoring, AI based disease diagnosis, and real time weather intelligence together in one free platform, this application helps farmers move from reacting to crop problems after they occur to preventing them before serious damage is done, making advanced farming technology practical and affordable for those who need it most

Keywords: NDVI, Satellite Imagery, Plant Disease Detection, Crop Monitoring, Precision Agriculture, OpenWeatherMap, Google Gemini AI, Kindwise API

I. INTRODUCTION

Indian agriculture employs over 42% of the workforce but farmers still face challenges like unpredictable weather, crop diseases, and lack of modern tools. Traditional farming methods often miss early signs of problems that could be prevented with timely action. This project was built to provide an integrated, affordable solution combining satellite monitoring, AI based disease diagnosis, and real time weather intelligence in one free mobile application specifically designed for Indian farming conditions.

II. PROBLEM STATEMENT

Farmers currently rely on physically walking through fields to check crop health, which is time consuming and often too late to prevent damage. Early stage diseases are difficult to identify without expert consultation, which involves delays that allow diseases to spread further. Weather forecasts available to farmers are too general and do not account



for local variations. No single affordable tool currently combines all three of these solutions together, which is the gap this project addresses.

III. METHODOLOGY

The application was developed in three modules over 44 days and then integrated into one Android and iOS platform.

A. Satellite Based Crop Monitoring

The satellite module uses NDVI analysis with imagery from NASA GIBS, Sentinel-2, and Landsat-8 displayed through the Leaflet mapping library. Farmers can view color coded vegetation health maps of their fields and track changes over time without stepping outside. NDVI values range from -1 to +1 where healthy vegetation typically scores between 0.3 and 0.8.

B. Image Based Plant Disease Detection

The disease detection module allows farmers to photograph an affected plant, which is analyzed simultaneously by Plant.ID and Crop.Health APIs from Kindwise. Google Gemini AI then combines both results with farmer provided context to generate easy to understand explanations and treatment recommendations in local languages.

C. Weather Analysis and Alert System

The weather module uses the OpenWeatherMap API with GPS based location detection to provide hyper local current conditions, 48 hour hourly forecasts, and 7 day outlooks. Custom alerts notify farmers when rainfall, temperature, or wind crosses thresholds that could harm their crops, along with recommended actions.

D. Application Integration

All three modules share data with each other. For example, weather conditions are factored into disease probability assessments, making the overall analysis more accurate. The unified interface supports regional languages and runs smoothly even on basic smartphones through background loading and image compression.

IV. CONCLUSION

This application delivers a practical, free tool that puts advanced crop monitoring within every farmer's reach. By combining satellite analysis, AI powered disease detection, and location specific weather alerts into one simple platform, farmers can now spot problems early and make informed decisions without expensive technology or specialized knowledge. The project demonstrates that smart farming tools can be both powerful and accessible for those who need it most.

V. ACKNOWLEDGMENT

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