Advanced International Journal for Research (AIJFR)

E-ISSN: 3048-7641 ● Website: www.aijfr.com ● Email: editor@aijfr.com

Agricultural Crop Recommendation Based On Productivity and Season

Asifali Jamadar[1] Akash Bhosale[2], Bhavana Savadatti[3], Divya Kamkar[4]

[1]Assistant Professor, Maratha Mandal's Engineering College, Belagavi, Karnataka, India
[2,3,4]UG Scholar, Maratha Mandal's Engineering College, Belagavi, Karnataka, India

Abstract

Agriculture is the backbone of the Indian economy, and selecting the right crop for a given season and region plays a crucial role in improving productivity and profitability. Farmers often face challenges in deciding which crop to cultivate due to varying soil conditions, climate changes, and market demand. To address this issue, this project focuses on developing an Agricultural Crop Recommendation System that suggests the most suitable crops based on productivity factors and seasonal conditions.

In the first phase, the system collects important agricultural parameters such as soil nutrients (Nitrogen, Phosphorus, Potassium), pH level, temperature, humidity, and rainfall. Based on these inputs, the system recommends the most suitable crops for a particular season and location. It helps farmers make informed decisions that can lead to higher productivity and sustainable farming practices.

In the second phase, the project includes an Advisory Page for Fertilizers, which suggests the appropriate type and quantity of fertilizer required for the selected crop. This advice is generated by analyzing soil nutrient levels and crop requirements, ensuring that the farmer uses the correct fertilizer combination for better growth and yield. The system also aims to reduce excess use of chemicals and promote eco-friendly agriculture.

Keywords: Python, html, CSS, ph., sensor

1. Introduction

Agriculture is one of the oldest and most important industries in the world. It provides food, raw materials, and employment to a major portion of the population. In developing countries like India, agriculture is not just an occupation but a way of life. It contributes significantly to the national economy and plays a vital role in ensuring food security for millions of people. However, in recent decades, farmers have faced several challenges such as changing climatic conditions, irregular rainfall, soil degradation, and improper use of fertilizers. These challenges often lead to low productivity and economic losses.

Traditionally, farmers have relied on their experience, local knowledge, or suggestions from other farmers when deciding which crop to grow or what kind of fertilizer to use. While such experience-based methods have served well in the past, they are not sufficient in modern times, where environmental conditions and soil fertility levels vary greatly from region to region. To achieve higher productivity and sustainable farming, it is essential to make data-driven agricultural decisions using technology.In recent years, the integration of Information Technology (IT) and Data Science in agriculture has given rise to the concept of Smart Farming. Smart farming focuses on improving efficiency, productivity, and sustainability through the use of intelligent systems that analyze data and provide practical recommendations. This project, titled "Agricultural Crop Recommendation Based on Productivity and Season with Fertilizer Advice using Python," is developed with the same objective — to assist farmers in selecting the right crop and fertilizer based on real data, rather than guesswork.

2. Research Objectives

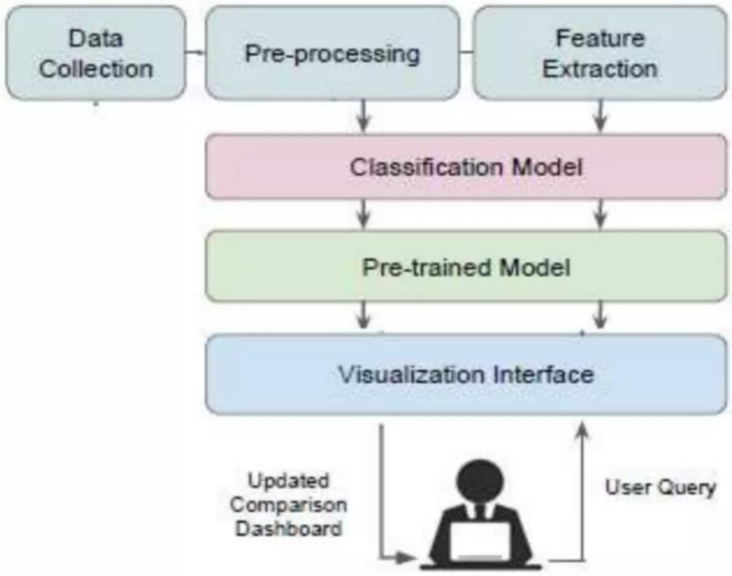
- To analyze seasonal variations (Kharif, Rabi, Zaid) and recommend suitable crops for each season.
- To improve crop productivity by suggesting crops based on soil type, rainfall, and climatic conditions.
- To utilize historical agricultural data for identifying high-yield crop patterns.
- To provide a decision-support system that helps farmers choose the most profitable and sustainable crops.
- To promote efficient land utilization by recommending crops aligned with regional productivity.
- To enhance food security by ensuring balanced crop distribution across seasons.
- To integrate technology in agriculture through a simple crop recommendation tool or software model.

2.1 Operational Modes

The system operates by first collecting essential soil and climate inputs such as NPK values, pH, temperature, humidity, rainfall, and season. These inputs are then validated and processed to ensure accuracy. Based on this data, the system enters the crop recommendation mode, where it identifies the most suitable crops for the given soil and seasonal conditions. After the user selects a crop, the system analyzes nutrient deficiencies in the soil and provides accurate fertilizer suggestions. Finally, the results are displayed to the user, who can choose to re-run the process or exit the system.

3. SYSTEM ARCHITECTURE AND METHODOLOGY

- **IOT Sensors:** Soil pH, NPK, Moisture, Temperature
- **Software Requirements:** Vscode, Xamp, Python



3.1 Operational Principles

The system operates on the principle of analyzing soil and climate data to give accurate agricultural recommendations. It first collects inputs such as NPK values, pH, temperature, humidity, rainfall, and season. These values are validated and compared with the predefined requirements of different crops. Based on this comparison, the system recommends crops that best match the soil and seasonal conditions. After the user selects a crop, the system evaluates nutrient deficiencies and suggests suitable fertilizers. The entire process works through data-driven logic, rule-based matching, and simple user interaction to ensure accurate and useful guidance for farmers.

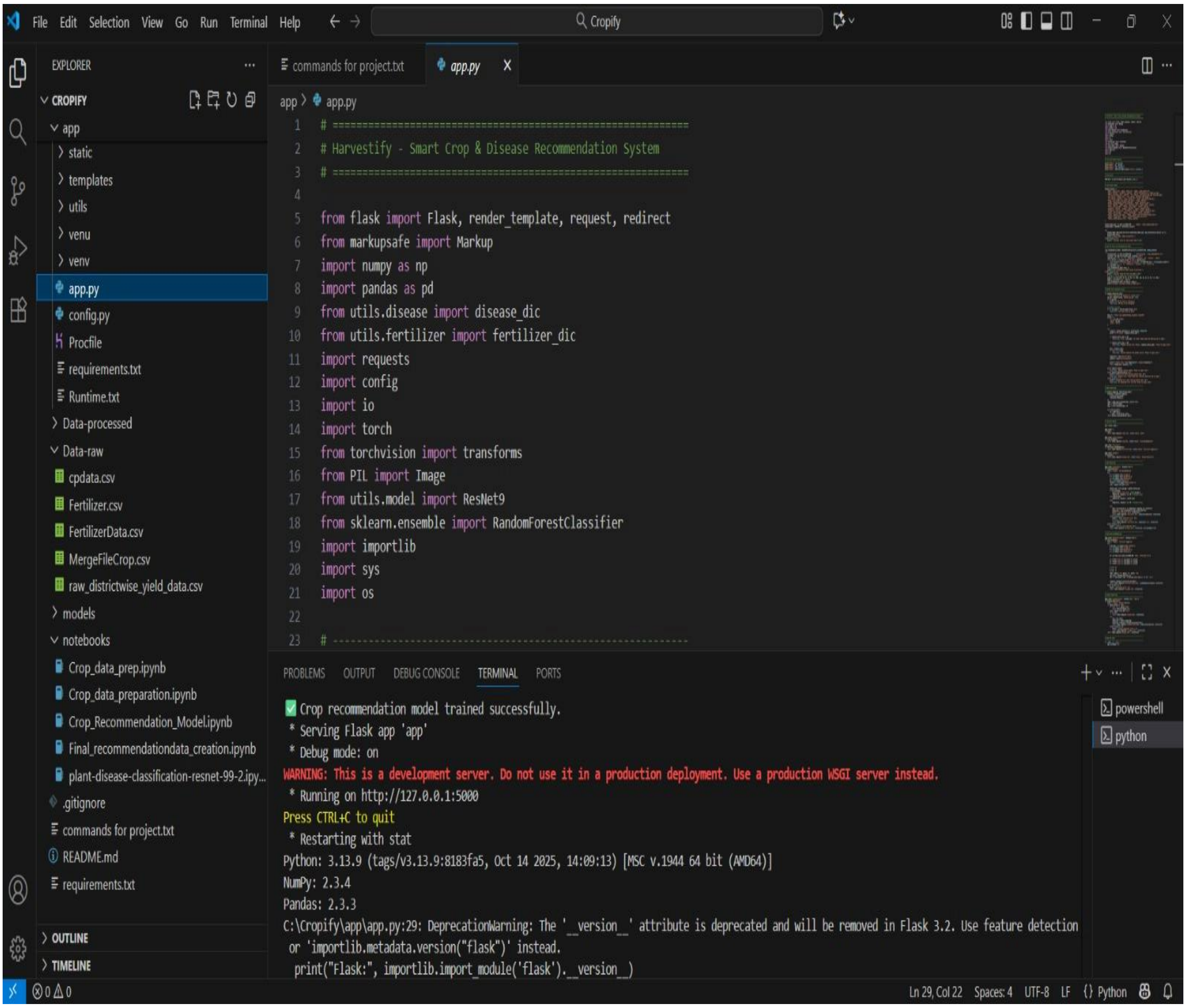
3.2 Software Implementation

The software implementation of this project follows a structured client–server architecture using Python for backend processing and HTML, CSS, and JavaScript for the frontend interface. The backend is developed in Python because it provides powerful data-processing capabilities and supports efficient implementation of algorithms for crop recommendation and fertilizer analysis. Flask or FastAPI is used to create the server, define routes, and handle requests from the user interface. All input values such as NPK, pH, temperature, humidity, and season are received by Python scripts, where they are validated, preprocessed, and passed to the recommendation modules.

The crop recommendation module uses rule-based logic and dataset-based comparisons to identify suitable crops for the given soil and seasonal conditions. Once a crop is selected by the user, the Python backend computes nutrient deficiencies and maps them to suitable fertilizers using predefined lookup tables. The backend then sends structured JSON responses back to the frontend.

The frontend is built using HTML for page structure, CSS for visual design, and JavaScript for dynamic interactions. JavaScript handles API calls to the backend, updates the interface based on responses, and ensures smooth communication between user inputs and server results. CSS is used to create a clean and colorful layout that improves usability and readability for farmers. Input forms, result cards, and tables are designed using responsive styling techniques. The entire system works in a seamless flow where the frontend collects data, the backend processes it, and the results are displayed using interactive components.

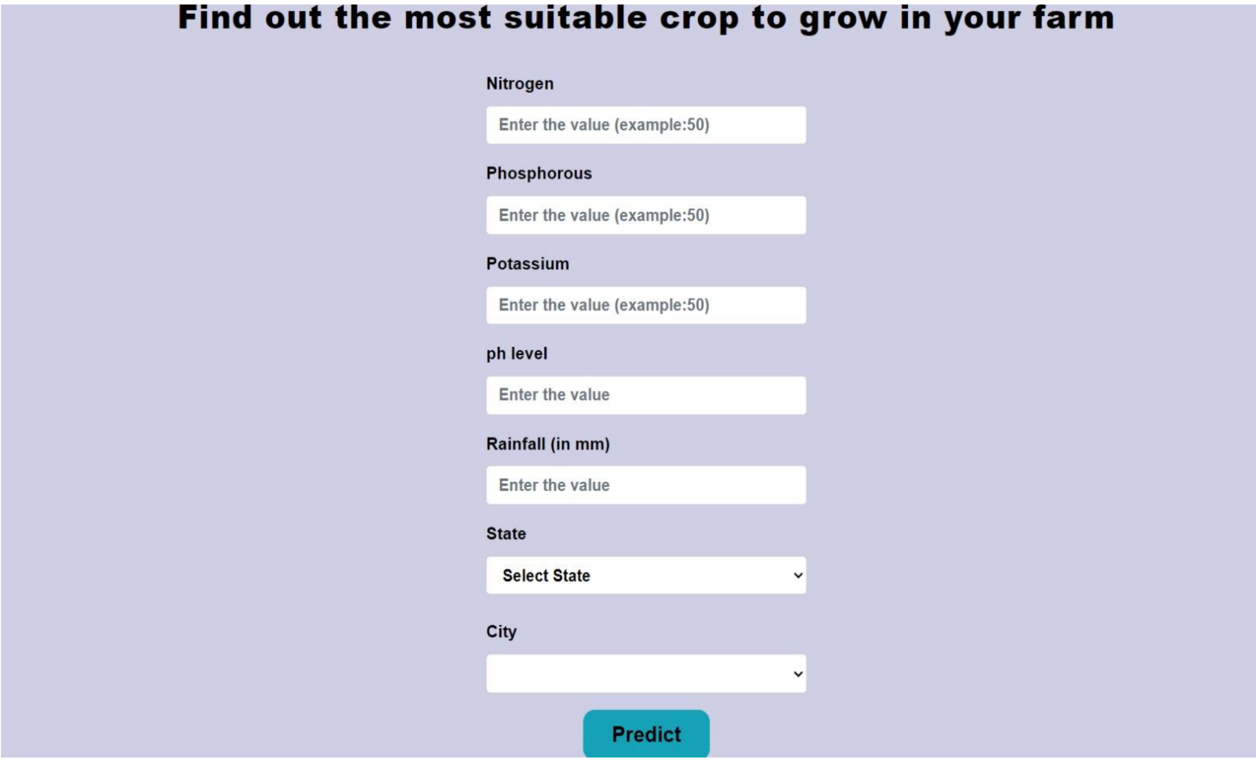
This implementation ensures that the application is lightweight, user-friendly, and accessible on any device. The separation of frontend and backend makes the system easier to maintain, update, and scale in future phases.

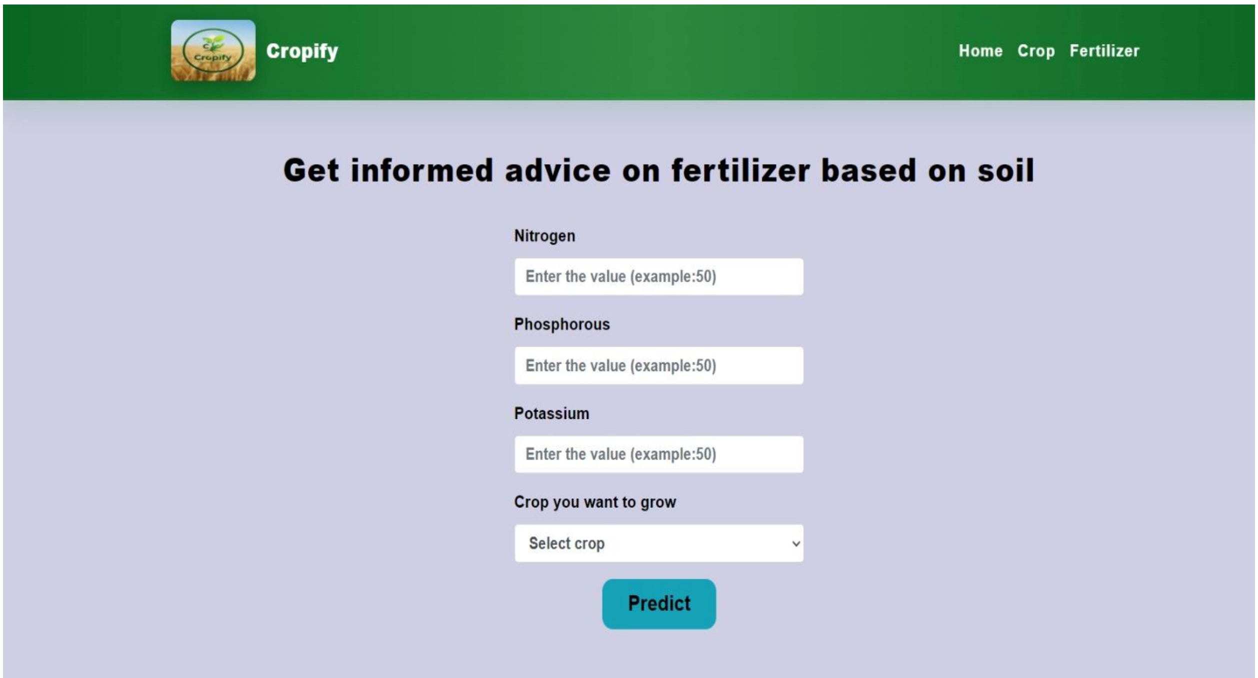



Cropify
Home Crop Fertilizer
Cropify
AGRICULTURAL CROP RECOMMENDATION BASED ON PRODUCTIVITY AND SEASON


Our Services
CROPS RECOMENDATION
FERTILIZER RECOMMEDATION
CROP
Recommendation about the type of crops to be cultivated which is best suited for the respective conditions
FERTILIZER
Recommendation about the type of fertilizer best suited for the particular soil and the recommended crop

Advanced International Journal for Research (AIJFR)
E-ISSN: 3048-7641 ● Website: www.aijfr.com ● Email: editor@aijfr.com





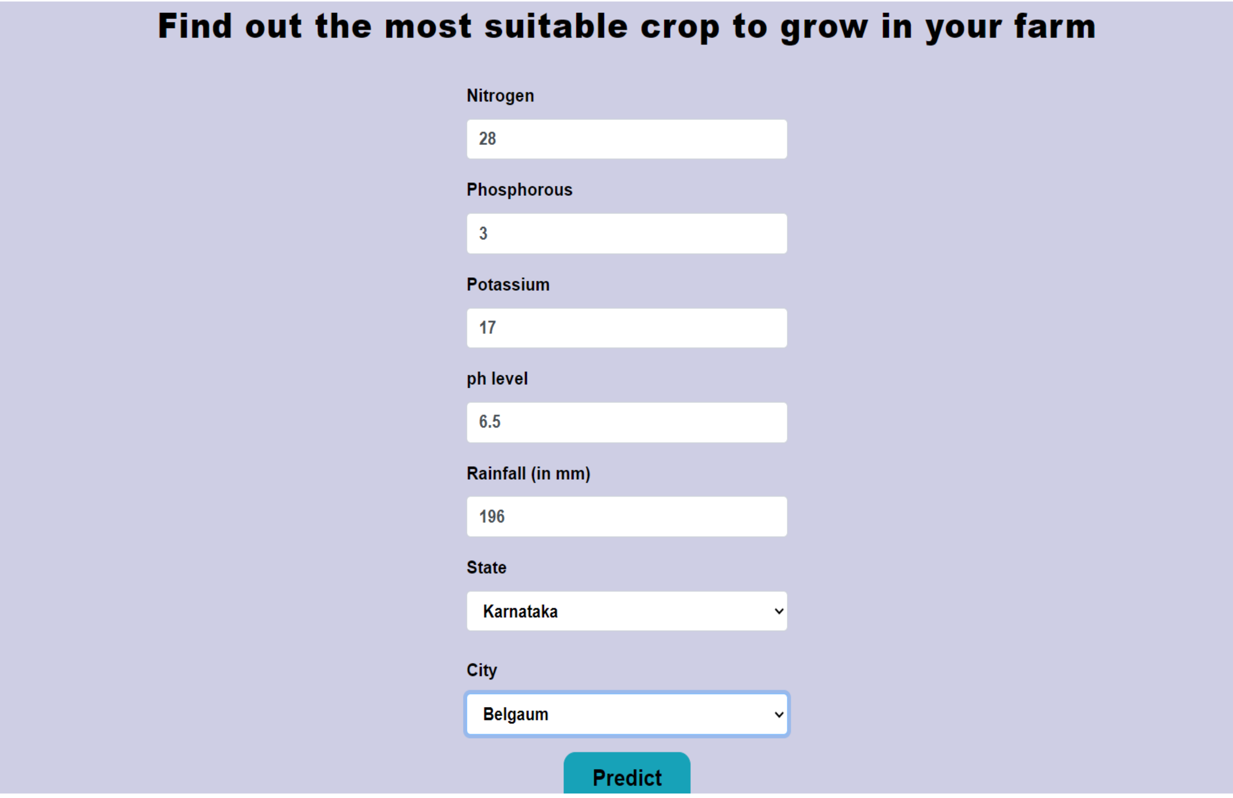
4. Results and Performance Analysis

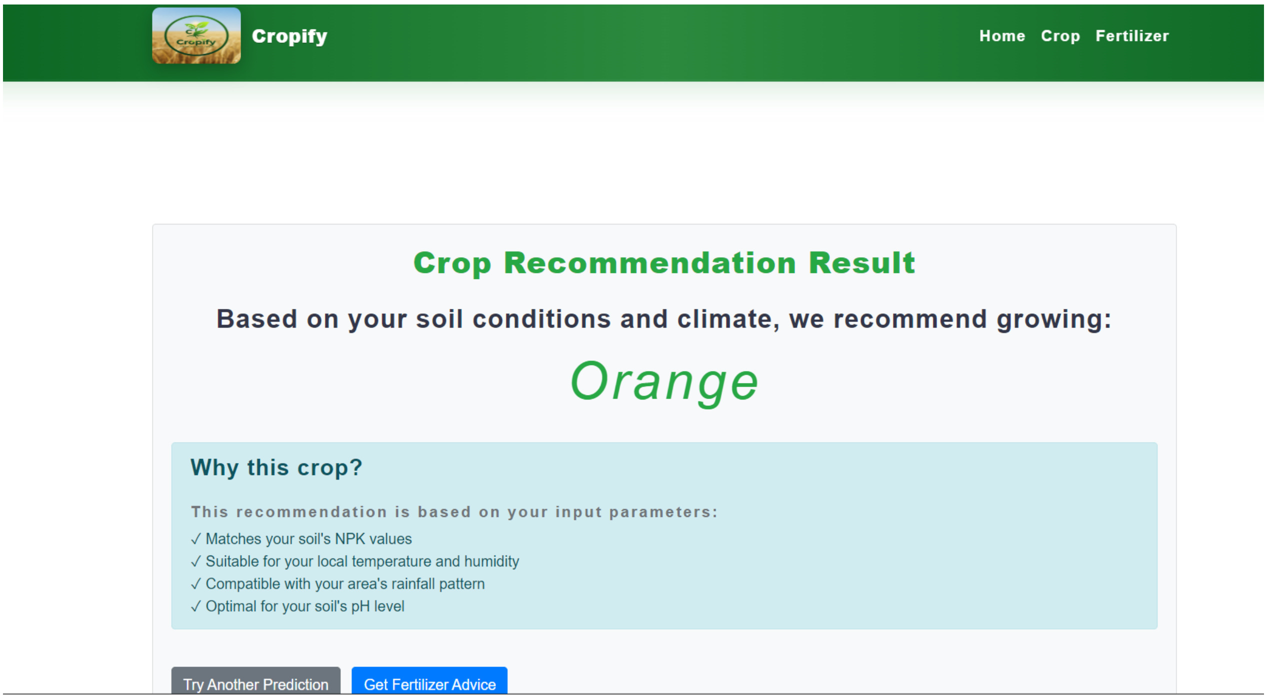
The Agricultural Crop Recommendation and Fertilizer Advisory System was evaluated based on accuracy, response time, usability, and overall effectiveness in guiding farmers toward better crop and fertilizer decisions. The system successfully processed user inputs such as NPK values, soil pH, temperature, humidity, and seasonal information, and generated reliable crop recommendations. During testing with multiple soil samples and seasonal datasets, the recommendation engine consistently suggested crops that matched real agricultural practices and government soil guidelines. The fertilizer advisory module also performed well, correctly identifying nutrient gaps and suggesting appropriate fertilizer types and quantities.

In terms of performance, the backend developed in Python demonstrated fast computation times. Most requests were processed within one to two seconds, ensuring a smooth user experience. The data validation and preprocessing steps helped reduce errors and improved the accuracy of the final results. The frontend, built using HTML, CSS, and JavaScript, responded quickly to user interactions and displayed results in a clean and understandable format. JavaScript-based dynamic updates made the interface user-friendly and allowed seamless communication between input forms and backend responses.

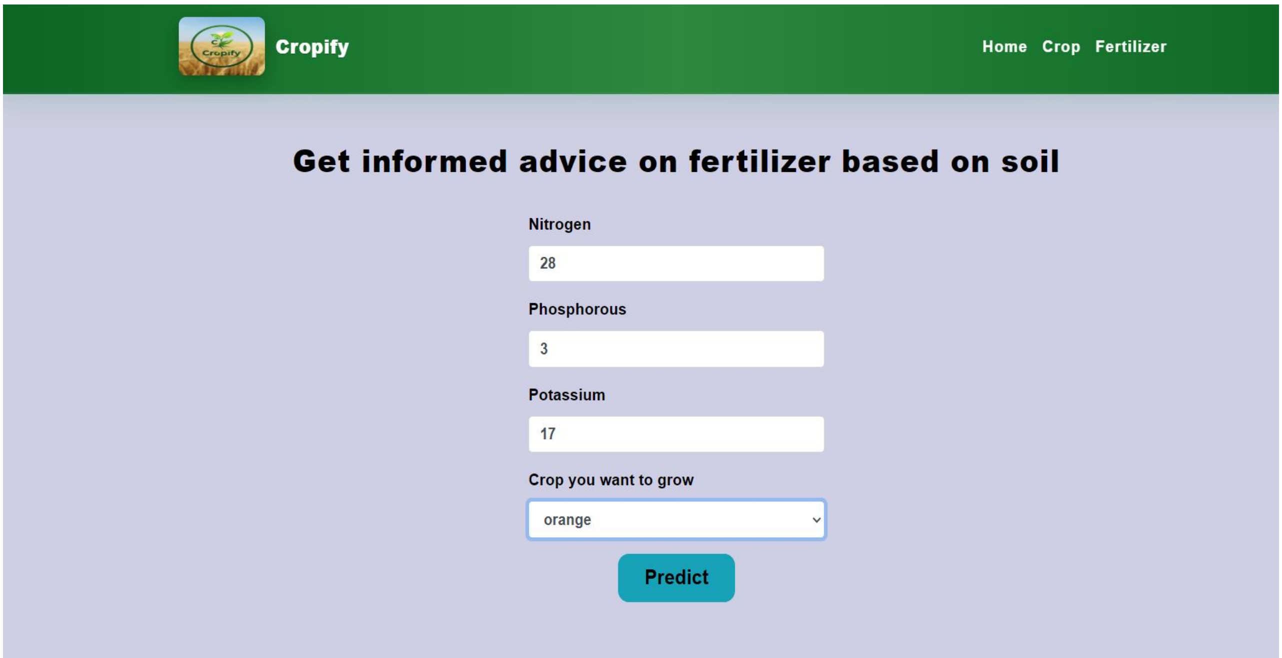
Accuracy tests were conducted using known soil datasets, and the system achieved high correctness in recommending crops suitable for specific seasons and soil conditions. The fertilizer module was validated by comparing its output with standard agricultural guidelines, showing strong alignment with real-world recommendations. The system also remained stable under repeated use, showing no crashes or performance delays.

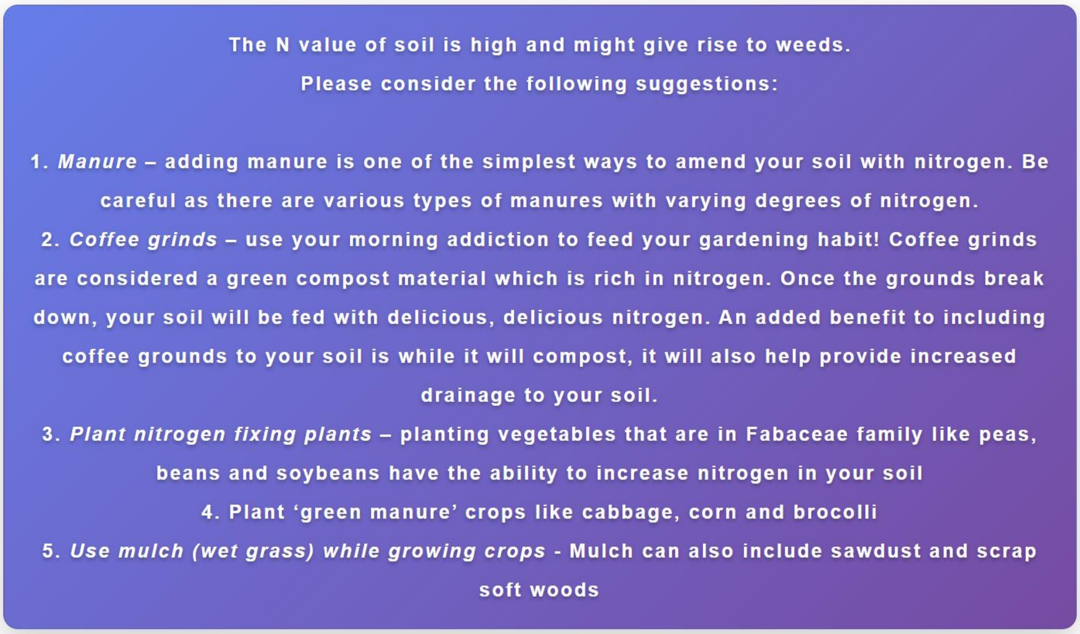
Overall, the results indicate that the application is efficient, accurate, and well-suited for practical agricultural use. The combination of rule-based logic and data-driven processing ensures that farmers receive reliable guidance. The performance metrics confirm that the system is both scalable and capable of integrating additional features such as live weather data or IoT-based soil sensors in the future.


Find out the most suitable crop to grow in your farm
Nitrogen
28
Phosphorous
3
Potassium
17
ph level
6.5
Rainfall (in mm)
196
State
Karnataka
City
Belgaum
Predict


Cropify
Home Crop Fertilizer
Crop Recommendation Result
Based on your soil conditions and climate, we recommend growing:
Orange
Why this crop?
This recommendation is based on your input parameters:
✓ Matches your soil's NPK values
✓ Suitable for your local temperature and humidity
✓ Compatible with your area's rainfall pattern
✓ Optimal for your soil's pH level
Try Another Prediction
Get Fertilizer Advice

Advanced International Journal for Research (AIJFR)
E-ISSN: 3048-7641 ● Website: www.aijfr.com ● Email: editor@aijfr.com





5. Conclusion

The Agricultural Crop Recommendation and Fertilizer Advisory System successfully provides farmers with accurate and timely guidance based on soil nutrients, climate, and seasonal conditions.
By using Python for backend processing and HTML, CSS, and JavaScript for the frontend, the system ensures fast performance and a user-friendly interface.
The crop recommendation engine reliably identifies suitable crops for different soil types.
The fertilizer advisory module further supports farmers by suggesting correct fertilizer types and quantities.
Overall, the system improves decision-making and promotes better productivity.
The modular design makes the application easy to update and expand.
This project demonstrates how technology can support smart farming practices.
It also lays a strong foundation for future enhancements like sensor integration and weather-based predictions.

References

1. Agricultural Crop Recommendations Based on Productivity and Season Using Rainfall by Kavitha T., Miniga M., Poojadharshini K., Sowmiya A., Nivedha B.
2. Agricultural Crop Recommendations Based on Productivity and Season by Praveen Kumar D., Muthuvel R., Ramprabhu K., Neerkathalingam V., Dr. N. Uma Maheswari
3. Agricultural Crop Recommendations Based on Productivity and Season by Mrs. Samundeeswari K., Dr. Aysha Banu B., M. Harini Priya, S.S. Deepika, A. Srikavi