iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** V **Month of publication:** May 2025

DOI: https://doi.org/10.22214/ijraset.2025.71026

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

Crop Recommendation and Yield Prediction Based on Geographical Location with Web Interface

Dundigalla Sai Satvik[1], Degala Sri Ram[2], Perrumalla Akhilesh[3], K. Victor[4]
[2, 2, 3]*Final year Students, Dept of Electronics and Communication Engineering Geethanjali College of Engineering and Technology, Hyderabad, India*
[4]*Sr. Assistant Professor, Dept of Electronics and Communication Engineering Geethanjali College of Engineering and Technology, Hyderabad, India*

Abstract: ***Agriculture is crucial in maintaining the global economy and food security. Yet, farmers sometimes have difficulty choosing the most appropriate crops and estimating yield prospects because of the varying climatic conditions, soil types, and availability of resources. This project seeks to overcome this difficulty through designing an internet-based intelligent crop recommendation and yield prediction system using geographical location information.***
The system involves integrating machine learning algorithms with geospatial information to study environmental factors like soil, temperature, rain, and humidity. By using past agricultural data and current weather inputs, the model prescribes best crops based on geographical locations and forecasted yields. The system is implemented via a simple web-based interface, through which farmers and stakeholders can feed location-specific inputs and receive insights immediately.
This methodology not only improves farmers' decision-making but also helps in precision agriculture, optimization of resources, and sustainable farming. The modular design provides scalability and flexibility to accommodate various regions and crops, thus making the system a valuable instrument in contemporary agritech solutions.
Keywords: Crop Recommendation, Yield Prediction, Geographical Location, Web Interface, Machine Learning, Precision Agriculture, Soil Analysis, Weather Data, Crop Suitability, Agricultural Decision Support, Smart Farming, Data-Driven Agriculture, Crop Yield Forecasting,

I. INTRODUCTION

Agriculture continues to be the pillar of most economies, particularly in developing nations, where it sustains the livelihood of a large percentage of the population. Yet, conventional farming practices tend to encounter problems like ineffective crop choice, unstable yields, and climatic variability. With rising worldwide demand for food and the urgent need for sustainable agriculture, using technology to maximize agricultural productivity has become crucial.

This project aims to create a system that offers smart crop suggestion and yield estimation based on geographical position and environmental conditions, presented through an easy-to-use web interface. By combining data like soil type, temperature, rainfall, humidity, and location-based trends, the system can assist farmers in choosing the most appropriate crops for cultivation and offer insights into predicted yields. The solution proposed involves integrating data science, machine learning, and web development to meet two major goals: suggesting the most suitable crops to cultivate in a specific location and forecasting possible crop yields based on past and real-time information. This allows farmers to make informed decisions, cut input expenses, enhance productivity, and limit environmental degradation. The web interface helps to make all these sophisticated analysis capabilities available to even non-technical users, making it an effective tool in contemporary agriculture. In the long run, the project helps towards improving food security, encouraging green agriculture, and facilitating the use of digital solutions in the farming industry.

II. LITERATURE SURVEY

Shende et al. [1] had suggested a crop recommendation system based on machine learning algorithms that provide recommendations for crops depending on soil parameters like pH, nitrogen, phosphorus, potassium content, and environmental factors like temperature and humidity. Their system used a Decision Tree classifier, which provided high accuracy in prediction, and was incorporated within a web interface to make the recommendations accessible to farmers in a user-friendly manner.

Srinivas et al. [2] proposed a yield forecasting model that utilizes real-time weather and past crop production data. Applying a Random Forest Regression methodology, the authors were able to predict crop yields of major cereals and oilseeds. The authors highlighted the need to integrate geospatial data sets and proposed integration with APIs for weather data to increase prediction accuracy.

©IJRASET: All Rights are Reserved

Patel and Patel [3] built a mobile-web platform for crop selection based on K-Nearest Neighbor (KNN) and Support Vector Machine (SVM) classifiers. Their framework processed agro-climatic inputs such as rainfall, soil moisture, and temperature. The research proved that machine learning algorithms can provide immense decision-making assistance to small-scale farmers and underlined the requirement for regional personalization.

Mohanraj et al. [4] presented an IoT-supported smart agriculture system that gathers sensor information (e.g., soil moisture, temperature, and humidity) and sends it to a server for processing. The system was developed with real-time crop and irrigation suggestions, employing rule-based decision-making as well as supervised models of learning. The outcome was enhanced productivity and efficient resource utilization.

Kamble et al. [5] considered the applicability of deep learning algorithms, viz., Long Short-Term Memory (LSTM) networks, to predict crop yield over heterogeneous climatic conditions. Their effort used satellite remote sensing, weather, and historical yields. In conclusion, their work stated that deep learning are significantly good methods in capturing the temporal relationships inherent in agricultural information and are far superior to existing statistical methods.

Kaur and Singh [6] introduced a GIS-based crop recommendation system that combines geographical position, soil maps, and remote sensing information to suggest crops and predict yields. Their online application enables the entry of farm coordinates by users and offers real-time suggestions. The authors highlighted the use of open-source geospatial libraries and user-centered design for maximum adoption.

III. PROPOSED METHODOLOGY

The proposed system is comprised of four main components: user input collection, data preprocessing and geolocation integration, machine learning-based crop recommendation and yield prediction, and result presentation through a web interface. Each module is meticulously designed to facilitate accurate, location-aware decision-making for farmers and agricultural planners.

.

A. User Input and Geolocation Retrieval

The first part of the system is inputting key agricultural parameters from the user. These parameters are soil conditions (pH, nitrogen, phosphorus, and potassium levels), present weather (temperature, humidity, rainfall), and optional manual input of previous yield. The geographical coordinates of the user are either automatically obtained by the browser's GPS API or entered manually by a region dropdown selector.

This geolocation information is of vital importance in defining regional climate patterns and soil conditions, which have a direct impact on crop viability and yield. To increase data accuracy, the system incorporates external weather APIs to retrieve real-time meteorological information based on the user's location.

B. Data Preprocessing and Feature Engineering

After collecting inputs, the system undergoes preprocessing to clean and normalize data. Soil nutrients are normalized into standardized units, and missing values are filled in by applying statistical methods like mean/mode substitution or interpolation. Categorical variables like soil type and region are converted to numerical representation through label encoding or one-hot encoding.

Feature engineering is utilized to create new features that may be used to improve model performance, including length of the growing season, agro-climatic zones at a regional level, and rainfall trend analysis. The new features, along with raw inputs, constitute the final dataset that is utilized for training and prediction.

C. Crop Recommendation Engine

The crop suggestion engine is based on a supervised machine learning model that has been trained on a labeled dataset consisting of soil, weather, and region inputs and the best crop that is to be cultivated in those conditions. Random Forest, Support Vector Machine (SVM), and Decision Trees were tested as algorithms, with Random Forest providing better accuracy and interpretability.

After receiving the processed input, the model suggests the most appropriate crop(s) based on the environmental and soil conditions provided. The system can respond with the top three suggested crops along with confidence levels so that users can choose an appropriate one based on market demand or their own preferences.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

D. Yield Prediction Module

At the same time as the recommendation engine, a model of yield prediction calculates the prospective crop output from past yields, geospatial location, and weather patterns. The regression model utilizes algorithms such as XGBoost or Linear Regression trained on farm-level datasets from government agencies and research organizations.

The model forecasted the approximate yield in kg/ha and provided it alongside the suggested crop. Farmers are able to optimize land utilization as well as prepare for post-harvest marketing, storage, or allocation through this information.

E. Web-Based Interface and Visualization

The system is made available through a light, responsive web application. Constructed using new frameworks like Flask (for backend) and ReactJS or HTML/CSS/JavaScript (for frontend), the interface enables smooth user access across desktop and mobile platforms.

The user interface presents input forms, crop suggestions, and yield projections in an easy-to-understand visual representation. Geographical heatmaps and bar charts are employed to contrast predicted yields for different crops and illustrate regional trends. Security measures like HTTPS and input validation guarantee data integrity and user privacy.

F. Feature Extraction and Model Deployment

System robustness depends significantly on the extraction of useful patterns from environmental and agronomic information. Feature extraction is the process of detecting the correlations among input variables—e.g., rainfall patterns and pH of soil—and crop output to develop usable insights. As an example, zonal rainfall normalization helps to eliminate seasonal variations, and indices of soil fertility are computed to more accurately represent nutrient status.

Models are trained through stratified sampling in order to maintain geographic diversity and deployed through containerized environments (e.g., Docker) on cloud platforms in order to maintain scalability. The system maintains batch updates for adding new training data and maintains online learning methods for ongoing performance enhancement.

This integrated strategy makes sure that both the recommendation and prediction modules function synergistically to help users select the most profitable and appropriate crops for their respective geographic and climatic conditions.

IV. RESULTS AND DISCUSSION

The constructed web interface presents an easy-to-use front end for crop yield prediction and crop recommendation, guaranteeing ease of use by farmers, researchers, and agricultural policymakers. The application was constructed utilizing Flask as the backend framework and Bootstrap for responsive and accessible design.

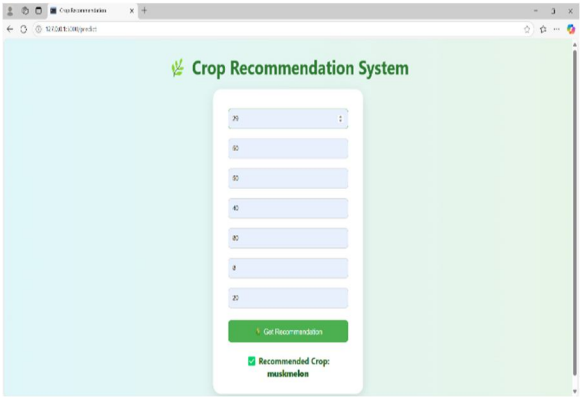


Figure 1: Output of Crop Recommendation

The initial interface (Figure 1) illustrates the Crop Yield Prediction System, which takes six major input parameters: year, average rainfall (mm/year), pesticide use (tons), average temperature (°C), geographical location (country), and crop item. After entering the input values and submitting, the model retrieves the data and applies a pre-trained regression algorithm to process the data, then presents the predicted yield in tons. For the provided sample inputs (Year: 2013, Rainfall: 458 mm, Pesticides: 632 tons, Temperature: 31°C, Area: India, Crop: Wheat), the model predicted yield was around 11,258 tons, demonstrating the model's ability to forecast agricultural production based on geographical and environmental factors.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

The second interface (Figure 2) is the Crop Recommendation System. This module is to recommend the best crop according to environmental factors like temperature, humidity, pH, rainfall, and nutrient levels (N, P, K). Upon inputting these inputs and activating the recommendation engine, the model evaluates soil and climate feasibility with a classification algorithm. For the given sample inputs (e.g., temperature: 29°C, N: 50, P: 50, K: 40, humidity: 80%, pH: 8, rainfall: 20 mm), the system suggests "muskmelon" as the best crop to be cultivated. The suggestion is an indication of the system's real-world usefulness in assisting farmers in making rational decisions based on agro-environmental considerations.

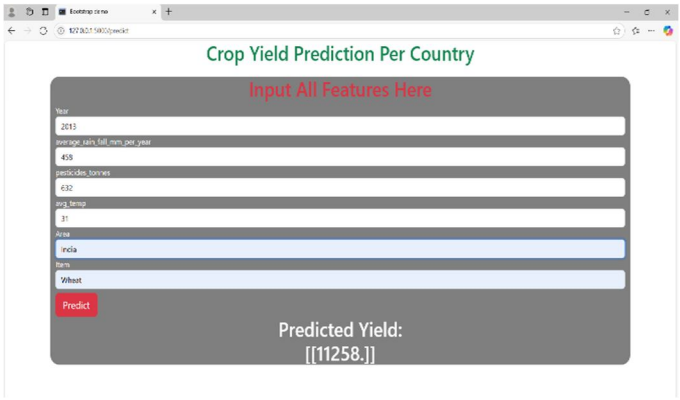


Figure 2: Output of Yield Prediction

These online outputs validate the real-time usability of the model as well as its capability to inform precision agriculture by way of data-based recommendations. Having machine learning forecasts integrated within an interactive portal makes it worthwhile by converting technical backend calculations into consumable farming tips.

V. CONCLUSION

In this work, an overall scheme for smart crop suggestion and yield estimation was presented and applied successfully using machine learning techniques within a web-based application that is easy to use. The system uses major agriculture-related parameters like temperature, rainfall, nutrients in the soil, and pesticide application combined with geospatial data to suggest results and predictions accurately. By utilizing actual-world datasets and leveraging efficient preprocessing and model training strategies, the system provides accurate results that can considerably benefit farmers and agricultural planners to make well-informed decisions. The bi-functional capability of crop suggestion and yield prediction enables users to choose the most ideal crop for cultivation and estimate the probable output based on environmental as well as geographical conditions. The application of the model on a web-based system provides ease of access, scalability, and real-time usage, making it a viable answer to the needs of current agriculture. The visual interfaces provide more ease of interaction and minimize the complexity involved with data-based systems. Future development could also involve integrating real-time weather APIs, satellite data, and geographically specific soil testing results to further enhance the accuracy of the system. Including multilingual capability and mobile usability would also render the system farmer-friendly. On the whole, the system outlined here offers a worthwhile step towards precision agriculture and sustainable farming methods.

REFERENCES

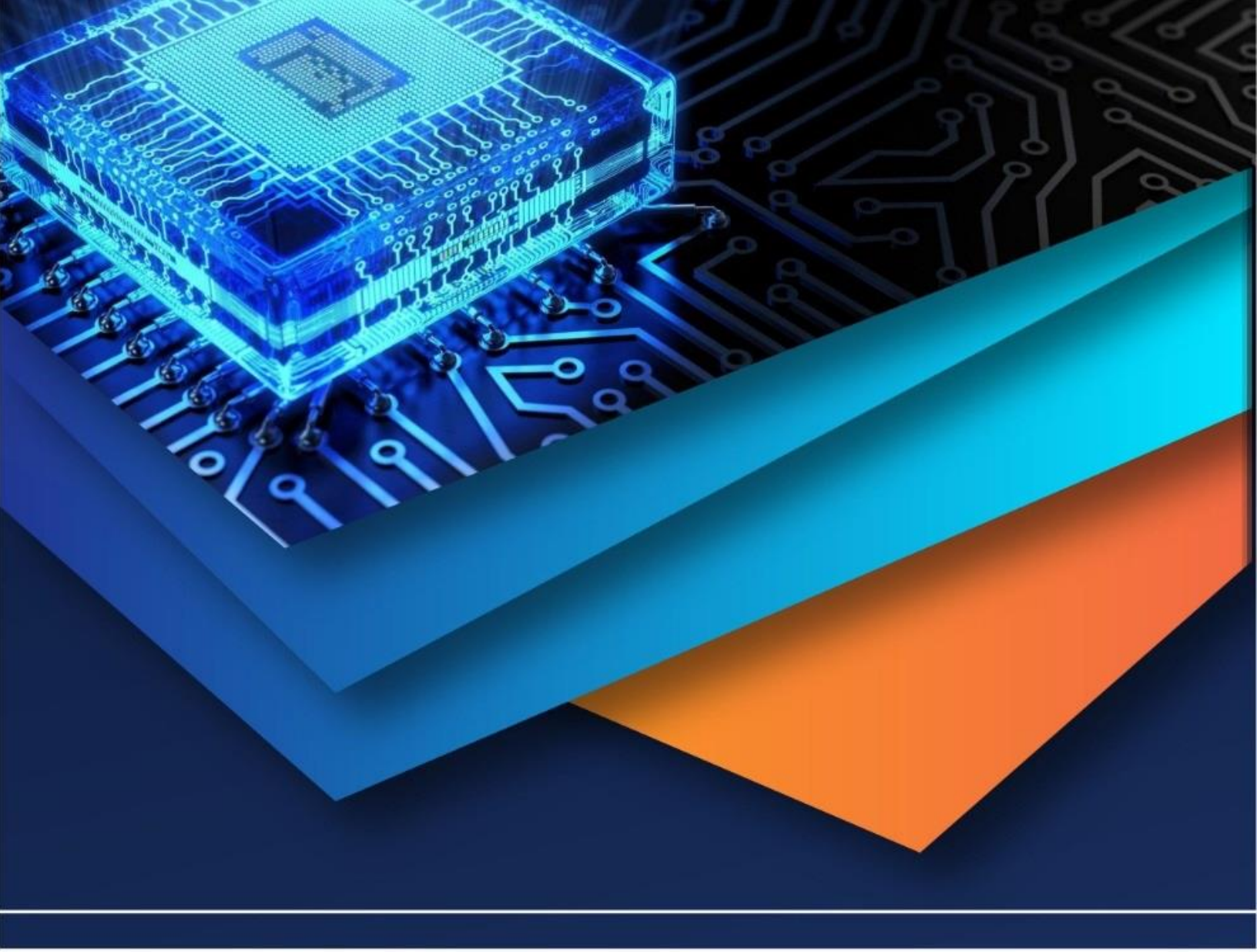
[1] R. K. Jadhav, P. P. Malkar, and A. V. Khandekar, “Crop yield prediction using machine learning algorithms,” in 2021 6th International Conference for Convergence in Technology (I2CT), IEEE, pp. 1–4
[2] K. M. Patil and R. Kumar, “Recommendation of crop yield using machine learning algorithms,” International Journal of Engineering Research & Technology (IJERT), vol. 9, no. 5, pp. 352–356, 2020.
[3] D. Bhagat, A. Patil, and S. Bakale, “Agriculture crop prediction using machine learning: A review,” in 2019 IEEE International Conference on Smart Structures and Systems (ICSSS), pp. 1–3
[4] S. B. Patil and B. S. Thorat, “Early detection of pests using image processing and IoT for agricultural crops,” in 2019 International Conference on Communication and Electronics Systems (ICCES), IEEE, pp. 1–6
[5] A. Singh and A. Jain, “Crop yield prediction and efficient use of fertilizers,” International Journal of Scientific & Engineering Research, vol. 9, no. 5, pp. 188–192, 2018
[6] A. D. Shirsath and S. K. Mungmode, “Machine learning approach for crop recommendation,” in 2020 International Conference on Emerging Smart Computing and Informatics (ESCI), IEEE, pp. 488–491
[7] N. V. Chavan and S. N. Deshmukh, “Web based crop recommendation system using machine learning approach,” International Research Journal of Engineering and Technology (IRJET), vol. 7, no. 6, pp. 2341–2346, 2020.

[8] A. Tripathi and M. J. Sinha, "Crop prediction using machine learning approach," in 2018 International Conference on Computing, Power and Communication Technologies (GUCON), IEEE, pp. 750–753.
[9] M. Jadhav, P. Jadhav, and N. Mohite, "Smart farming using web technologies and machine learning," International Journal of Computer Applications, vol. 975, no. 8887, pp. 36–40, 2019
[10] P. P. Raut and M. A. Khan, "Crop recommendation system for precision agriculture," in 2019 International Conference on Smart Systems and Inventive Technology (ICSSIT), IEEE, pp. 1121–1124
[11] A. Rani and A. P. Yadav, "Crop recommendation based on soil parameters using ML algorithms," in 2021 11th International Conference on Cloud Computing, Data Science & Engineering (Confluence), IEEE, pp. 548–553.
[12] R. S. Garge and S. A. Aher, "Soil nutrient based crop prediction using decision tree," International Journal of Innovative Research in Computer and Communication Engineering, vol. 6, no. 4, pp. 4753–4757, 201

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)