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Volume 14, Issue 5, May 2025 |DOI: 10.15680/IJIRSET.2025.1405475| KrishiPrajna

Mrs Vinutha Prashanth, Sakshi K, S Kavya, Prasanna Geetika, B H Harshitha

Associate Professor, Department of CSE, Rao Bahadur Y Mahabaleshwarappa Engineering College, Karnataka, India

UG Student, Department of CSE, Rao Bahadur Y Mahabaleshwarappa Engineering College, Karnataka, India

UG Student, Department of CSE, Rao Bahadur Y Mahabaleshwarappa Engineering College, Karnataka, India

UG Student, Department of CSE, Rao Bahadur Y Mahabaleshwarappa Engineering College, Karnataka, India

UG Student, Department of CSE, Rao Bahadur Y Mahabaleshwarappa Engineering College, Karnataka, India

ABSTRACT: KrishiPrajna presents a machine learning-driven system designed to optimize agricultural productivity through accurate crop yield prediction and smart irrigation management. Traditional farming heavily depends on intuition and past experiences, often resulting in inefficiencies. By integrating environmental, soil, and weather data, our system leverages algorithms such as Support Vector Machines, Random Forest, and Multiple Regression to forecast yields with high precision. Additionally, it incorporates real-time soil moisture analysis to recommend optimal irrigation practices, conserving water and enhancing sustainability. This scalable, data-centric solution empowers farmers with actionable insights, bridging technology with agriculture to foster decision-making, resource optimization, and food security.

KEYWORDS : Machine learning, crop yield prediction, smart irrigation, sustainable agriculture, SVM, Random Forest, precision farming, soil analysis, real-time monitoring, AI in agriculture.

I. INTRODUCTION

Agriculture remains a cornerstone of global economies and food systems. Yet, it faces escalating challenges including climate change, soil degradation, and inefficient resource utilization. Farmers continue to rely on conventional methods, which are increasingly unreliable in today's dynamic climate. KrishiPrajna introduces a data-driven alternative using artificial intelligence to enhance agricultural decision-making. By analyzing diverse datasets—ranging from weather conditions to soil parameters—the system provides predictive insights that help farmers improve crop planning, resource use, and yield. The system's smart irrigation feature further supports sustainability by recommending water application based on real-time data.

II. LITERATURE SURVEY

Literature Survey

The digital integration of agricultural intelligence enhances productivity and sustainability.

- 1. Machine Learning in Agriculture Traditional farming practices often lack precision, highlighting the need for automated, data-driven systems using models like SVM, Random Forest, and Regression for scalable crop yield prediction.
- 2. Soil and Climate Monitoring Tracking real-time environmental data such as pH, NPK levels, and weather helps reduce resource wastage and improve decision-making.
- 3. Web-Based Agricultural Systems Cloud-integrated platforms improve reliability through real-time analytics, role-based user access, and automated insights.
- 4. **Decentralized Smart Farming** Scalable platforms like KrishiPrajna bridge centralized data models and local farm-level decisions, supporting sustainable and adaptive agriculture.





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III. METHODOLOGY

System Functional Specification

Functions Performed

- **Prediction** Estimates crop yield using ML models based on environmental inputs.
- **Monitoring** Tracks real-time data like soil moisture and weather.
- Automation Schedules irrigation and fertilizer recommendations.
- Security Role-based access control for users.
- Analytics Generates yield reports and decision support insights.
- Sustainability Promotes efficient use of water and fertilizer.

System Database / File Structure Preview

The **KrishiPrajna** platform uses **Django** for backend processing. Soil and weather data are stored in structured format using SQLite. Role-Based Access Control ensures secure data usage. A modular backend supports **APIs** via Django REST Framework, while a user-friendly React frontend provides dynamic visual dashboards. The system enables effective monitoring, resource automation, and smart recommendations for farms.

User Input / Output Specification

- Input: Soil data (pH, moisture, NPK), weather info, crop details; with authenticated access.
- Output: Real-time yield predictions, fertilizer and irrigation tips, warnings for anomalies.
- Format: Interactive UI with insights on crops, weather trends, and resource suggestions.

External and Internal Limitations and Restrictions

- External: Internet access, sensor quality, data privacy, regional scalability, and compliance with agriculture policies may affect system usage.
- Internal: ML model accuracy, UI responsiveness, real-time scheduling, sensor calibration, and maintenance needs influence system performance and trustworthiness.

IV. SYSTEM DESIGN

System Architecture

- Frontend: Built using React, the system offers interactive dashboards for real-time monitoring of crop yield and resource usage.
- **Backend:** Django handles API communication and business logic, while PostgreSQL (or SQLite3) stores processed agricultural data.



Fig 3.1: System design for proposed system

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- 3.2SystemDataFlowDiagrams
- UserInteraction:ReactfrontendsendsrequeststoDjangobackendviaRESTfulAPIs.
- BackendProcessing:DjangoperformsCRUDoperationswithrole-basedaccesscontrol.
- Data Display: Processed data is shown on the frontend using Mantine UI.
- **Deployment:** The system runs on a secure web server with monitoring.
- Testing & Validation: Ensures data integrity, security, and seamless communication.

Use case Diagrams.



The KRISHIPRAJNA project requires an Intel i5+ processor, 8GB+ RAM, and internet connectivity for optimal performance. It uses Python, JavaScript, SQLite3, and APIs, deployed with cloud support and security via encrypted storage and regular backups.

• Implementation Languages

The KRISHIPRAJNA project uses Python (with libraries like Scikit-learn, Pandas, TensorFlow), JavaScript (Node.js for backend), HTML/CSS/JS for frontend, and SQL (SQLite3) with API integration and real-time data processing to ensure scalability and accuracy.





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SYSTEMVERIFICATION

System verification ensures the KRISHIPRAJNA project meets requirements through testing. **Tests:** Crop yield prediction, fertilizer suggestions, irrigation recommendations, weather analysis, and user interface. **Key Areas:** Accuracy, scalability, usability, data processing, and real-time adaptability. **Validation:** Ensures ML model performance, database integrity, API integration, and reliable user interactions.

V. EXPERIMENTAL RESULTS

USER SCREEN SHOTS

LOGIN PAGE





MARKET PREDICTION PAGE: Farmer & Customer

KRISHIPRAJNA CRO	P CROP STATS	FERTILIZER TO	DLS CROPS	WEATHER	MARKET C	OMMUNITY	LOGOUT	FAR
		arket Dr		diatia	-			
	M	arket Pr	ice Pre	aictio	n 			
Ballar	i Whol	esale Man	di Marke	t prices	as of To	oday		
Commodity	City	Variety	Maximum	Average	Minimur	m Last		
			Price	Price	Price	Updat	ted On	
Alasande Gram	Bellary	Alasande Gram	₹ 7,515	₹ 7,331	₹ 6,102	07 Fel	2025	
	Bellary	Hybrid	₹ 2,789	₹ 2,652	₹ 2,512	07 Fel	2025	
Bajra(Pearl								
Bajra(Pearl Millet/Cumbu)								
Bajra(Pearl Millet/Cumbu) Foxtail Millet(Navane)	Bellary	Navane Hybrid	₹ 3,331	₹ 2,535	₹ 1,631	07 Fel	o 2025	





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CROP PREDICTION: Farmer& Customer

	1911
Crop	Output
Nitrogen	Recommended Crops:
Phosphorous	
Pottasium	- grapes - watermelon - banana
Pottanlum ph level	grapes watermelon banana
Pottasium ph level Bainfail (in mm)	· grapes · watermelon · banana
Portraitum ph level Beinfall (in mm) Temperature	· grapes · watermelon · banana

CROP STATS: Farmer

KRISHIPRAJNA CROP CROP STATS FERTILIZER TOOLS	S CROPS WEATHER MARKET COMMUNITY LOGOUT 💉 .
Crop Stats	Output
Choose Crop Apple	Time Series for carrot
Price Prediction Resolts Month and Year with Highest Price: June 2025 Predicted Highest Price: 70155	1000 - predicted
and the statement of	
	0 90 100 139 200 239 Days

FERTILIZER PREDICTION: Farmer& Customer



WEATHER PREDICTION: Farmer& Customer



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COMMUNITY(FAQ):Farmer& Customer



UPLOAD(Farmer):

Tools



Crops



VI. CONCLUSION

The **KRISHIPRAJNA** project integrates machine learning models (SVM, Random Forest, Regression) with real-time soil and weather data to predict crop yield with high accuracy. Smart irrigation suggestions reduce water wastage, while automated recommendations minimize manual decision-making and improve farming efficiency.





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KRISHIPRAJNA promotes sustainable agriculture by optimizing resource use, reducing chemical overuse, and enhancing crop productivity. Future plans include IoT sensor integration, AI-based crop disease detection, mobile app development, and cloud-based scalability enhancements.

Planned upgrades include a mobile app for offline access, real-time alerts, and smart dashboards. The tech stack includes Python (Scikit-learn, TensorFlow), JavaScript (Node.js), SQLite3, and cloud storage, enabling a scalable and intelligent precision farming ecosystem aligned with sustainable development goals.

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