



AgriGyan: Knowledge driven intelligence platform

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Abstract: Farmers are the backbone of the Indian economy but farmers are involved in age-old practices, poor use of resources and financial risk. AgriGyan is one AI based web app developed with the intention of combining the latest technology with the age old farming practices and bridge this gap. It is a platform that provides features such as field mapping, crop planning, expenses and income, and real time advisory services. This paper presents the system design of AgriGyan, the approaches taken, and effectiveness analysis of AgriGyan, along with the role of AgriGyan in enhancing agriculture productivity and environmental sustainability. But despite their crucial role, many farmers are still relying on centuries-old practices that are outdated, unsustainable and poorly suited to 21st-century challenges. These old methodologies, combined with lack of access to advanced tools and technologies, lead to bad resource usage, low productivity, and a huge financial risk.

Keywords: Smart Agriculture, Data Visualization, Recommendations, Agriculture Technology, Sustainable Farming, Data-Driven Farming. Etc.

I. INTRODUCTION

India is an agricultural economy, and 60-70 percent of the population depends on this sector. The key features of AgriGyan include real time decision making support, interactive field mapping, AI powered crop expert and expense tracker. The field mapping tool enables the farmers to lay out their field, check on the soil, measure weather and enhance crop production. The crop expert module incorporated with artificial intelligence provides site specific solutions for disease and pest management, and soil fertility management to enhance the crop production; the crop planner provides unbiased and precise timing for planting, watering, fertilizing and harvesting to ensure that resources are used to their fullest capacity. The farmers can also use the expense tracker to identify the costs that are incurred at the different stages of the farming process to avoid incurring more expenses than are necessary for the farm's sustainability. AgriGyan enhances and completes the agriculture sector with data analysis, artificial intelligence and technology to enhance the production.

II. MOTIVATION

The motivation behind AgriGyan stems from the need to empower farmers with knowledge and technology that can significantly improve agricultural practices. By leveraging data analytics, IoT, and AI, AgriGyan aims to provide real-time insights into crop health, weather patterns, and market trends. This not only enhances productivity and efficiency but also ensures sustainable farming practices. Ultimately, AgriGyan seeks to bridge the gap between traditional farming methods and modern technology, ensuring better yields and economic stability for farmers.

III. PROBLEM STATEMENT

Indian farmers often lack access to essential tools like crop planning, expense tracking, and expert guidance, limiting their productivity and profitability. Agri Gyan seeks to bridge this gap by providing a comprehensive, user-friendly platform to support informed decision-making and sustainable agricultural growth.



IV. PROPOSED METHODOLOGY

Uses an ETL pipeline with cloud-based tools such as Apache Kafka for batch processing, spring boot and for the real time data streaming. CRUD operations are use Spring Boot's JPA to easily store and retrieve the large amount of data needed. Crop Yield Prediction: It uses Linear Regression and Decision Trees using Random Forest and Gradient Boosting for accuracy. Weather Data Analysis: Uses time series to predict future weather patterns. K-Means clustering on soil types for Soil health assessment and recommend suitable crops. Frontend React - modular, responsive and mobile-friendly user. Backend - Built using Spring Boot with RESTful APIs for serving real-time forecasting, crop planning, user data management, etc. Keeps the design intuitive for farmers to provide them with that seamless interaction with dataviz, crop advisory tools, and financial management The combination of these techniques not only allows for efficient data processing and predictive analytics, but also ensuring user-centered design, making AgriGyan a scalable and impactful AgriTech solution.

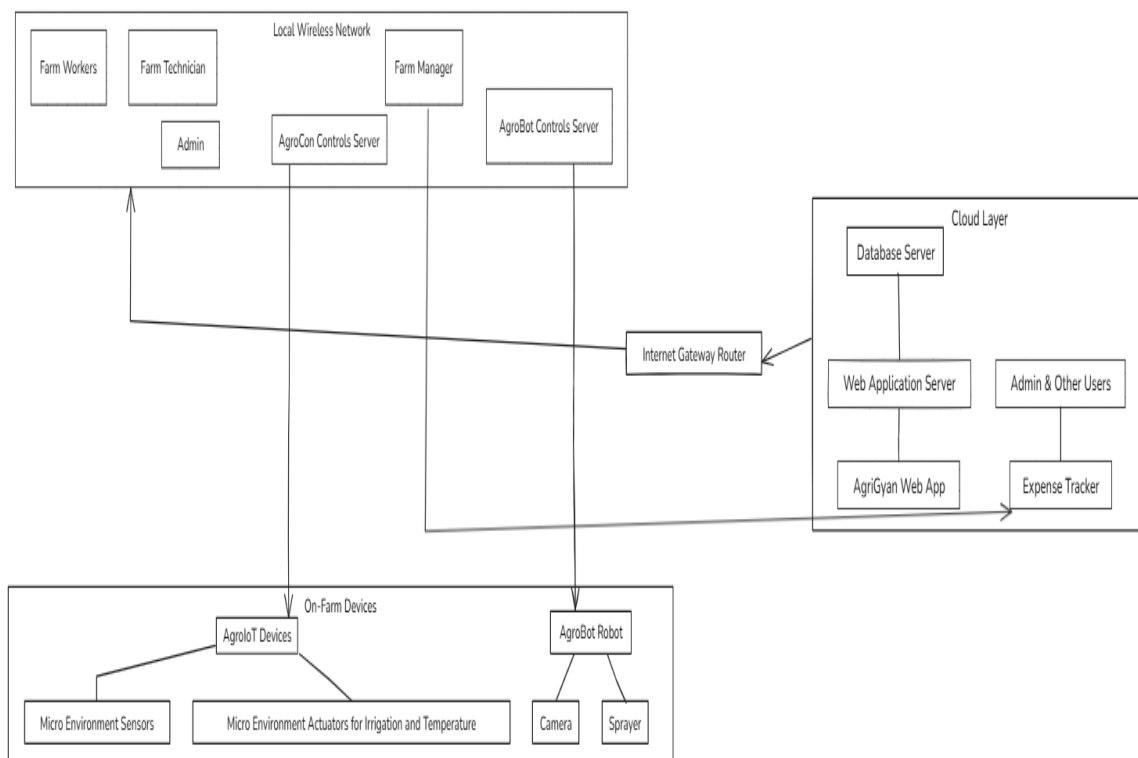
a) Hardware Requirements:

Sr. no	Resources	Configuration
1.	Processor	Intel i5
2.	Speed	1.1 GHz
3.	Ram	8 GB
4.	Hard Disk	500 GB

b) Software Requirements:

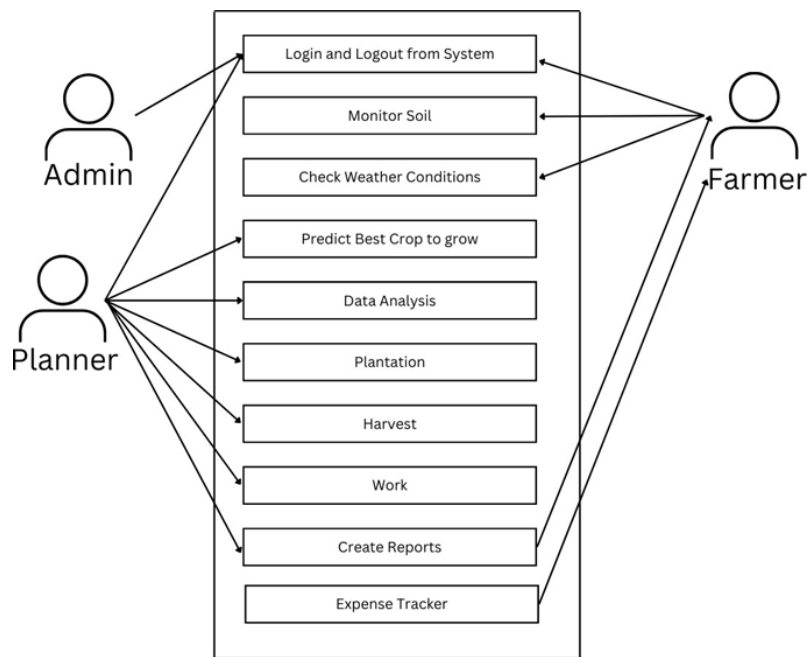
Sr. No.	Resource	Configuration
1.	Operating System	Windows 11
2.	Coding Language	React, Java
3.	Software	VS Codes

V. SYSTEM ARCHITECTURE





VI.UML Diagram



Use Case Diagram

VII.KEY FEATURES AND IMPLEMENTATIONS

AgriGyan combines the latest in tech and makes them handy for the agrarian populace. This provides a set of solutions that aim to enhance farming operations and provide guidance for making informed decisions. Interactive Field Mapping, one of the system's key components, uses GPS and satellite imagery to give farmers real-time insights about soil health, crop conditions, and localized weather patterns. It allows farmers to make strategic decisions based on precise data. AgriGyan also provides expense tracking feature which allows farmers to track their expenses effectively and plan the finances with the help of expense tracker. AI-Driven Crop Expert Module, is another important feature that uses ML models to provide personalized suggestions on crop selection, disease a responsive and efficient user experience. AgriGyan believes that combining AI-driven insights with traditional agricultural knowledge will allow farmers to have data-driven approaches to increasing productivity returning resources in and an optimized manner.

VIII.FUTURE SCOPE

1. Multilingual Support: Farmers from a variety of linguistic backgrounds in India will find the application more accessible and useful if it is expanded to support regional languages.
2. Market Linkage and E-Commerce: To boost farmers' profit margins, a future extension could incorporate a marketplace module that links them directly with consumers, merchants, and wholesalers.
3. IoT-based Smart Farming Tools: By incorporating additional IoT devices, such as soil sensors, smart irrigation systems, and pest traps, farm management can be automated and recommendations can be made with even greater accuracy.
4. Government schemes guide: Through a single platform, government agricultural schemes can make it easier for farmers to access loans, subsidies, and support services.

IX.CONCLUSION

AgriGyan is an AI powered comprehensive tool about sustainable farming with the help of the latest technology as well as the conventional farming methods. In the future, we intend to apply Internet of Things (IoT) devices to watch various farming conditions. There are two things that blockchain technology will improve, the transparency and the reliability of the supply chain as well. Furthermore, we intend to support several languages and to have AgriGyan available for use by farmers all over the world.

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